ftServer T30
Technical Service Guide

Revision 0 - 5/21/04

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Manual Name: *ftServer T30 Technical Service Guide*
Services Technical Communications Department

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Preface

The *ftServer T30 Technical Service Guide* contains technical information pertinent to ftServer systems operating under the Stratus fault-tolerant Linux operating system.

This document is organized as follows:

Section 1 - Introduction

Section 2 - Operation and Troubleshooting Procedures

Section 3 - CRU Removal and Replacement Procedures

Section 4 – FRU and DRU Removal and Replacement Procedures

Section 5 - Theory of Operation

Section 6 - Upgrades

Section 7 - Part Numbers

Section 8 – Related Documentation

Audience

This guide is intended for authorized service personnel who install and maintain Stratus systems, and who have completed Stratus field-service training courses.

1. Introduction

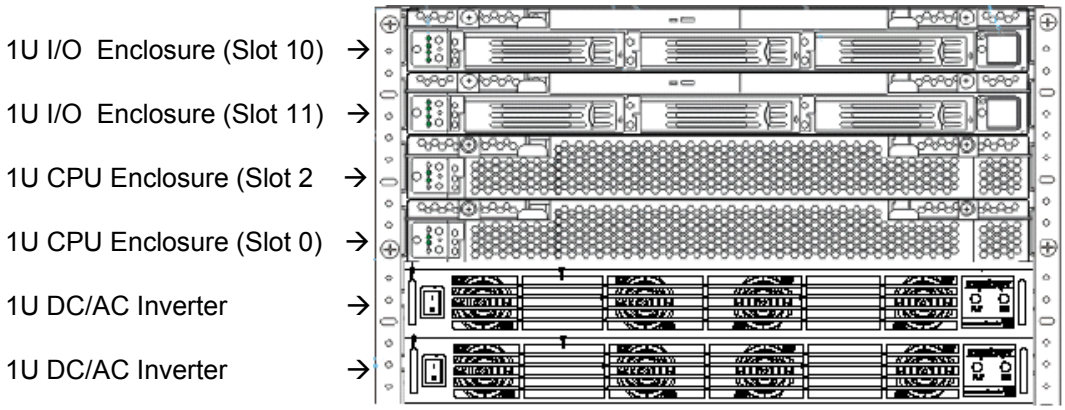
This section describes the requirements, components, configurations, and specifications for the Stratus ftServer T30 system. It covers the following topics:

- Overview
- Operating system requirements
- Hardware components
- System configurations
- System specifications

1.1 Overview

The ftServer T30 is designed and packaged for Central Office (CO) environments. In addition to its fault-tolerant system architecture, Stratus provides fault-hardened device drivers, which enhance application reliability and availability. It is a modular, rack-optimized, NEBS Level 3 Compliant entry-level ftServer system supporting the Stratus ft Linux operating system.

The ftServer T30 consists of a 6U system, rack mounted in a standard 19-inch customer-supplied cabinet. The diagram below is a representation of the system configuration, independent of a cabinet.



The ftServer T30 is based on the 2.4-GHz Intel Xeon processor (400-MHz Front Side Bus) and two-way (two processors per CPU enclosure) symmetric multiprocessing (SMP).

The ftServer T30 system consists of two CPU enclosures that provide dual modular redundancy (DMR), two core I/O enclosures, and two optional DC/AC inverters that convert DC power to AC. Alternately, the T30 components can be connected directly to two separate AC power sources (bypassing the DC/AC inverters) by external power cables.

Each enclosure and DC/AC inverter is 1U (1.75 inches) in height, totaling 6U of height per ftServer T30 system.

The CPU and I/O enclosures are installed from the front of the chassis and connect to a 4U backplane located at the rear of the chassis. Each DC/AC inverter is installed from the front and connects to a 1U backplane.

The clock card, power inlets, VGA, USB, serial ports, and connections to the installed PCI adapters are also located at the rear of the chassis.

To enable connectivity to the Stratus ActiveService Network (ASN), which allows the CAC or an authorized Stratus service representative to remotely manage the system, the system contains an external modem. With an external modem, ASN connectivity is only possible if the operating system is operational.

1.2 Operating System Requirements

The ftServer T30 system is supported by the Stratus ft Linux operating system, which is based on the Linux operating system with Stratus additions. These additions include software hardening features and support for Stratus fault-tolerant ftServer hardware.

The minimum release of Stratus ft Linux is 2.1.

1.3 Hardware Components

The main hardware components in the ftServer T30 system are the following:

- 2 CPU Enclosures
- 2 I/O Enclosures
- 4U Backplane
- 2 DC/AC Inverters (with backplanes)

1.3.1 CPU Enclosure

Each CPU enclosure contains:

- 2 processors
- 6 DIMM slots

The 2.4-GHz processors, with integrated 512-KB iL2 cache and 400-MHz Front Side Bus, are two-way SMP.

The ftServer T30 uses DDR (Dual Data Rate) Dual Inline Memory Module (DIMM) memory in 256-MB and 512-MB configurations. The minimum ftServer T30 logical memory is 512 MB and the maximum is 3 GB.

Up to six DIMMs can be housed in each CPU enclosure. DIMMs must be loaded in pairs.

Both CPU enclosures must be configured with identical total memory size. DIMMs of different capacities and from different manufacturers may not be mixed within a CPU enclosure. DIMMs of identical capacity must be mounted in the corresponding memory slot between each CPU enclosure.

DIMMs are installed in the designated memory slots to achieve the appropriate memory configuration. DIMM slot 0 (furthest from the Power Supply) must be populated first, then proceed numerically to DIMM slot 5.

The following table lists the memory modules currently supported in ftServer T30 systems.

Mktg. ID	Description	Minimum # per CPU Enclosure	Maximum # per CPU Enclosure
M227	256-MB DDR DIMM	2	6
M228	512-MB DDR DIMM	2	6

The following table shows the supported memory configurations:

Total Memory in Each CPU Enclosure	Number of Modules in Each CPU Enclosure
512 MB	2 M227 modules
1 GB	4 M227 modules or 2 M228 modules
1.5 GB	6 M227 modules
2 GB	4 M228 modules
3 GB	6 M228 modules

1.3.2 I/O Enclosure

Each IO enclosure contains:

- One CD-ROM drive
- One 10/100 Ethernet interface
- One 10/100/1000 Ethernet interface
- Three single-initiated internal SCSI disk slots
- One external SCSI port for tape drive
- One 32-bit 33-MHz PCI slot (reserved for the U917 VGA Adapter)
- Two 64-bit 33-MHz PCI slots

1.3.2.1 PCI Adapters

The table below describes the PCI adapters that can be configured in ftServer T30 systems. It also includes the minimum and maximum number of adapters supported

Mktg. ID	Description	Min. #	Max. #
U574	2-port 1000Base-Sx (Fiber Gigabit) Ethernet Adapter	0	4
U575	2-port 1000Base-T (Copper Gigabit) Ethernet Adapter	0	4
U917	VGA Adapter	2	2
U918	4-port T1/E1 Adapter (For SINAP)	0	4

For consistency of manufacturing, the default is to configure adapters in the order shown below unless otherwise specified within special instructions.

Adapter	Description	PCI 1	PCI 2	PCI 3
U917	**VGA Adapter**	**X**	|	|
U574 or U575	**2-Port ENET Adapters**	|	**O**	**R**
U918	**4 Port E1/T1 Adapter**	|	**O**	**R**

Key:

|	The corresponding PCI adapter cannot be installed in this slot.
X	The corresponding PCI adapter must be installed in this slot.
0	The corresponding PCI adapter has the option to be installed in this slot
R	The corresponding PCI adapter is recommended to be installed in this slot

1.3.2.2 SCSI Disk Drives

A minimum of four SCSI disk drives are required in ftServer T30 systems. All three disk slots in the top core I/O enclosure must be populated, as well as one in the lower enclosure.

The following table lists the SCSI disk drives supported in the core I/O enclosures.

Model	Description
D531	**36-GB disk drive (10K RPM)**
D532	**73-GB disk drive (10K RPM)**
D533	**18-GB disk drive (15K RPM)**

Different types of disk drives (for example 36-GB and 73-GB) can be used concurrently in the same ftServer T30 system, but only disks of the same capacity can mirror each other.

Each core I/O enclosure contains a dual-port SCSI processor. SCSI Bus 0 controls the internal disk drives and is fixed at 160MB/sec (no auto-negotiation). There are three bays for mounting hot-swap disk drives. The internal disk drives are mirrored to the corresponding drive bay of the partner core I/O enclosure.

The systems disk must be installed as a mirrored pair. It is recommended that all other disks be mirrored. When mirrored, this means each pair of physical disk drives equals one logical disk drive. The convention is [logical/physical] disk drives. For example, an ftServer T30 with six mirrored disk drives will be labeled [L3/P6].

The following is an explanation of internal SCSI disk installation. Refer to the following table for a diagram of internal disks and corresponding SCSI IDs.

Core I/O Enclosure		
SCSI ID 0	**SCSI ID 1**	**SCSI ID 2**
DXXX **DISK 1**	**DXXX** **DISK 2**	**DXXX** **DISK 3**

When configuring mirrored internal disk drives, refer to the SCSI ID numbers for the drives, shown above the disk drives.

Only the primary core I/O enclosure is scanned. The internal SCSI chip in the primary core I/O enclosure is scanned first by the system. All three SCSI ID's in the primary core I/O are scanned starting with SCSI ID 0. The first disk with a master boot record (if found) is determined to be the boot disk. The PCI bus is scanned after the SCSI chip starting with Slot 0. If a SCSI card is found, it will be scanned accordingly. If no boot disk was found on the internal disks, the first disk with a master boot record encountered in the SCSI enclosure will be considered the boot disk. If no boot disk is found, the system will performs a Fault Resilient Boot (FRB).

It is recommended that the boot disk be installed in the leftmost drive slot (SCSI 0).

1.3.3 Backplane

The ftServer T30 system contains a 4U backplane through which the CPU and I/O enclosures interconnect.

The backplane contains the system clock card, two IDPROMs, and the connector I/O card. The connector I/O card contains the serial, USB, and VGA ports.

1.3.4 DC/AC Inverter

Each DC/AC inverter supplies power from a NEBS -48 VDC power plant to half of the ftServer T30 system.

The DC/AC inverter connects to a separate backplane that contains DC input and AC output connectors. There are two versions of the DC/AC inverter: one supplies 120V, 60 Hz power. And the other supplies 230V, 50 Hz power.

1.3.5 Optional Components

Optional components of an ftServer T30 system include

- Tape drives
- Keyboard, mouse, and monitor
- External Floppy Disk Drive
- Modem

1.3.5.1 Tape Drives

ftServer T30 systems support DDS-4 tabletop tape drives. No tape drives are mounted in the cabinet. They are all external to the cabinet.

Each core I/O enclosure can support up to two daisy-chained tape drives or a single non-daisy-chained tape drive. The first tape drive in a daisy chain connects to the external SCSI port on the core I/O enclosure.

The external SCSI port is SCSI bus 1 and will auto-negotiate the appropriate speed and electrical interface (single-ended or differential).

The following table lists the tape drives supported on ftServer T30 systems.

Model	Description
T511	**HP-DDS-4 DAT tape drive**
T512	**HP-DDS-4 DAT tape drive with autoloader**

1.3.5.2 Keyboard/Monitor/Mouse

The V115 is a 107-key, USB-compatible keyboard with PS/2 mouse. The keyboard includes a PS/2 port to which the mouse can be connected. The keyboard and mouse connect to the system by a USB port.

The following table lists the keyboard, monitor, and mouse types.

Marketing ID	Description
V128	**ftServer 15” Rack Mount LCD Display with Keyboard Drawer**
V129	**External 15” Color VGA Monitor**
V115	**ftServer USB Keyboard/Mouse**
N/A	**Customer-Supplied Monitor**

1.3.5.3 External Floppy Disk Drive

The ftServer T30 system does not support an internal floppy disk drive. An optional external USB floppy drive (model number AK438) can be connected via a USB port.

1.3.5.4 Modem

The C719, an external serial 56K Data/Fax MultiTech ZBA modem, is used to connect to the Stratus ActiveService Network (ASN).

1.4 System Configuration

Marketing ID	P5101R-2D
Processor	DMR
SMP	2-way
Processor Speed	2.4 GHz
Cache size	512 KB iL2
Front-side bus	400 MHz
No. CPU Enclosures	2
No. Logical Processors	2
No. Physical Processors	4
Min/Max Memory	512 MB/3 GB

1.5 System Specifications

1.5.1 System

Physical	
Height	**AC System: 7 in. (17.78 cm; 4U)** **DC System: 10.0 in. (6U)**
Width	**17.75 in. (45 cm)**
Depth	**29.23 in. (75 cm)**
System weight	**AC System: 124 lb (56.25 kg)** **DC System: 137 lb (62 kg)**
Environmental	
Operating temperature	**5ºC to 40ºC normal - 0ºC to 50º Short Term**
Non Operating Temperature	**-40°C to +70°C (Unvented)** **-40°C to +60°C (Vented)**
Operating Altitude	**0 to 10000 ft (0 to 3048 m)**
Maximum rate of temp. change during operation	**12°C/Hour**
Relative humidity during operation	**5% to 85% Non-condensing**
Relative humidity during storage	**To 95%**
Acoustic Sound Pressure Limits	**Operating : 71 dBA max**
Heat dissipation	**4830 BTUs per hour**
Electrical	
Input wattage	**A-side: 1415W (DC)** **B-side: 1415W (DC)**
Service requirements	**AC Systems: 110 - 240 VAC** **DC Systems: -48 VDC**
Input voltage (Minimum)	**AC Systems: 110 VAC** **DC Systems: -40 VDC**
Input voltage (Normal)	**AC Systems: 200-240 VAC**

	DC Systems: -48 VDC
Input voltage (Maximum)	**AC Systems: 264 VAC** **DC Systems: -60 VDC**
AC Input frequency	**AC Systems: 50-60Hz** **DC Systems: NA**

1.5.2 V128 LCD Display

Physical	
Height	**1.75 in. (4.45 cm; 1U)**
Width	**19 in. (48.3 cm)**
Depth	**24 in. (61 cm)**
Environmental	
Operating temperature	**32 F to 104 F (0 C to 40 C)**
Storage temperature	**-13 F to +140 F (-25 C to +60 C)**
Relative humidity during operation	**10% to 80% (noncondensing)**
Relative humidity during storage	**5% to 95% (noncondensing)**
Heat dissipation	**38 BTUs per hour**
Electrical	
Output wattage	**21 W (AC)**
Input voltage	**90-265 volts AC; 47-63 Hz**

1.5.3 V129 LCD Display

Physical	
Height	**14.3 in. (36.2 cm)**
Width	**13.6 in. (34.2 cm)**
Depth	**7.3 in. (18.5 cm)**
Weight	**5.7 lb (2.6 kg)**
Environmental	
Operating temperature	**41°F to 95°F (5°C to 35°C)**
Storage temperature	**41°F to +113°F (5°C to 45°C)**
Relative humidity during operation	**30% to 80% (noncondensing)**
Relative humidity during storage	**5% to 90% (noncondensing)**
Heat dissipation	**103 BTUs per hour**
Electrical	
Output wattage	**30 W (AC)**
Nominal input voltage; Frequency	**90–265 volts AC; 47–63 Hz**

1.5.4 V115 Keyboard

Height	**2.5 in. (6.4 cm; 2U)**
Width	**19 in. (48.3 cm)**
Depth	**8 in. (20.3 cm)**

1.5.5 C719 External Modem

Physical	
Height	1.00 in. (2.5 cm)
Width	4.25 in. (10.8 cm)
Depth	5.60 in. (14.2 cm)
Electrical	
Output wattage	N/A
Nominal input voltage; Frequency range	100–240 volts AC; 50–60 Hz

1.5.6 T511 DDS-4 DAT Tape Drive

Power	
Output wattage	22.5 W (AC) max.
Nominal input voltage; Frequency	100–240 volts AC; 50–60 Hz
Physical	
Height	3.7 in. (95 mm)
Width	4.6 in. (116 mm)
Depth	8.7 in. (220 mm)
Weight	4.6 lb (2.1 kg)

1.5.7 T512 DDS-4 DAT Tape Drive with Autoloader

Power	
Output wattage	
Tape drive	17.4 W (AC) max.
Tape drive with autoloader	27.8 W (AC) max.
Nominal input voltage; Frequency	100–240 volts AC; 50–60 Hz
Physical	
Height	5.3 in. (135 mm)
Width	6.5 in. (165 mm)
Depth	10.6 in. (269 mm)
Weight	10.56 lb (4.65 kg)
Tape capacity	6 tapes

2. Operation and Troubleshooting Procedures

This section describes procedures related to ftServer T30 system operation and solving problems with the hardware components. It covers various topics, including the following:

- System startup
- System shutdown
- System component location and status
- Hardware component status LEDs
- **ftmaint** command

2.1 System Startup

Whenever the system is plugged into live DC outlets, low-level power is present in the ftServer system. This standby power enables the Baseboard Management Controller (BMC) to monitor the status of the system components, even when system power is off.

A duplexed ftServer T30 system contains two core I/O enclosures and therefore, two power buttons. Each power button includes an integrated LED. However, since only one I/O enclosure is the primary, "active" enclosure, only one power button is the active button—the one you use to power up the system. The LED in the active power button is lit when the system is receiving power.

The system power button is located on the front of the system and functions as follows:

- If the system power is **off** and standby power is **on**, pressing the front panel power button turns the system power on and boots the operating system.
- If the system power is **on** and the operating system or BIOS is starting, stopping, or running, pressing the system power button will turn the system off.

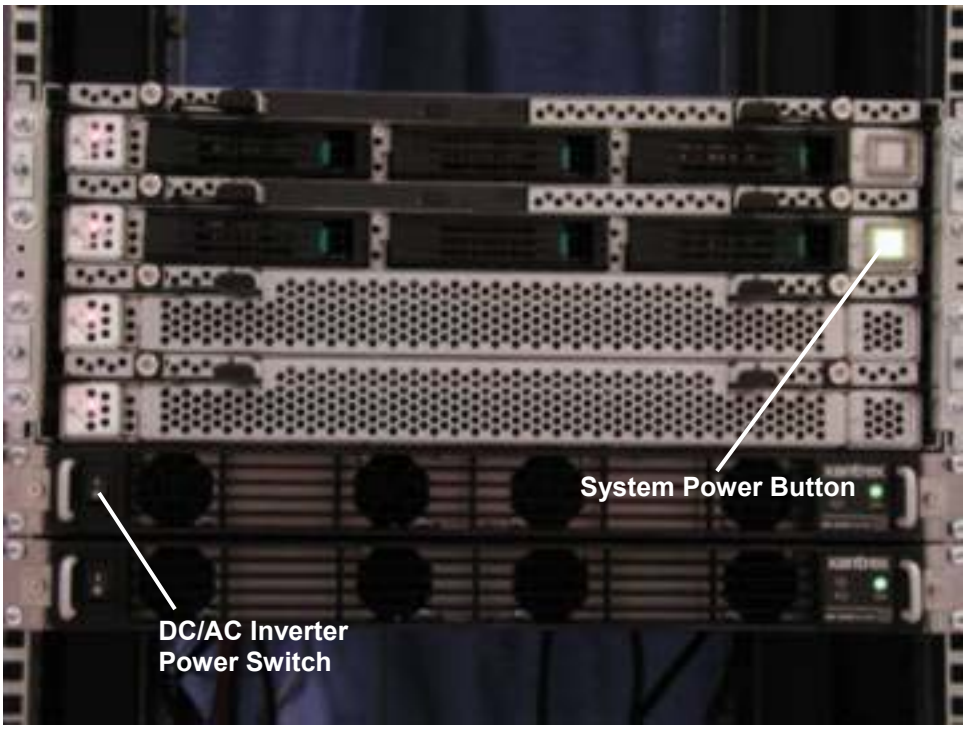
To initiate the power-up sequence, perform the following steps:

1. Make sure the system power cords are plugged into live DC outlets.
2. Turn on the monitor and any other peripheral devices.

3. Turn on both DC/AC inverters by turning their front panel switches to the ON position.
4. On the I/O enclosure whose power-button LED is lit, lift the plastic cover that shields the system power button and press the button.

   This powers on the system and boots the operating system.

Figure 2-1. System Power Button



2.2 System Shutdown

Before shutting down the ftServer, warn all users that a shutdown is imminent so that they have time to save their files and exit their applications. Give users sufficient time to exit.

Perform the following procedure to gracefully shut down an ftServer system running the Linux operating system. The operating system should always be shut down in this manner if at all possible.

1. Login as root. Password is su.
2. Change to the root directory and enter the following command to shut down the ft Linux operating system:

   shutdown –h now

3. Turn off both DC/AC inverters by turning their front panel switches to the OFF position.
4. Turn off power to the monitor and any peripheral devices.

   N OT E: There is still power to the system's standby devices, even after the system has been powered down. To remove power to the standby devices, you must disconnect the power cords.

2.3 Hardware Component Status LEDs

Hardware-based troubleshooting is implemented through light-emitting diodes (LEDs) that signal the status of various components. LEDs are located on the front of the CPU enclosures and DC/AC inverters, and on the front and rear of the core I/O enclosures.

During the boot process, the Baseboard Management Controller (BMC) verifies that components of CPU and I/O enclosures, such as clock cards, are present and performing normally before it turns that enclosure on. If a component has failed, the BMC removes power from that enclosure. As a result, the LEDs on an enclosure may be lit briefly and then turn off, or the LEDs may not be lit at all, indicating a failed component of the enclosure.

This section provides general information and guidelines for interpreting hardware omponent status LEDs in the ftServer system. For more information about monitoring and troubleshooting the system, refer to the *Stratus ft Linux System Administrator's Guide* (R003L).

2.3.1 CPU Enclosure LEDs

Each CPU enclosure has two LEDs, a red and a green-amber. They are located at the front of the enclosure.

The following table describes the meaning of the status LEDs when lit and shows what action, if any, should be taken.

LED	Meaning	Action
Red	**The CPU enclosure is broken.**	**Replace CPU enclosure.**
Amber	**The CPU enclosure is operating simplexed. Taking it offline will crash the system.**	**Return the offline CPU enclosure to service.**
Red and Green	**CPU enclosure is testing.**	**Wait.**
Green	**CPU enclosure is operating duplexed.**	**None.**
Clear (unlit)	**No standby power present.**	**Check that the enclosure is inserted correctly. Verify that the power cords are connected or take other measures to supply power to the system.**

2.3.2 Core I/O Enclosure LEDs

The LEDs on the core I/O enclosure are located on the front and rear of the enclosure.They consist of the following:

1. Baseboard Management Controller (BMC) status
2. Core I/O enclosure status
3. Disk activity/fault
4. Disk power, read/write
5. System power button and LED
6. Core I/O enclosure status
7. PCI adapter slot status

8. Ethernet port LEDs
9. 10/1000 Ethernet port
10. 10/100 Ethernet port

2.3.2.1 Baseboard Management Controller (BMC) LED

The BMC LED indicates the status of the BMC and the ftServer T30 system as a whole.

Each core I/O enclosure has a BMC LED. The primary BMC LED is the one on the I/O enclosure whose power button is lit (the primary enclosure). The secondary BMC LED is the one on the other I/O enclosure (the secondary enclosure). When a system is running in duplex with no error, only the primary BMC LED lights. This is the power button that powers the system on and off. The secondary BMC assumes operation and control of the system if the primary BMC goes offline.

The BMC LED is a single bicolor LED that either lights green, red, or amber (green and red together), or goes unlit to signify the states described in the following table.

> NOTE: The LED states defined in the following table are signaled only by the BMC LED on the primary I/O enclosure, except where noted.

LED	Meaning	Action
Red	**The BMC is not ready.**	**Wait.**
Blinking red	**BMCs are synchronizing, or the BMC firmware versions are incompatible.**	**Wait for synchronization to end. If condition continues indefinitely, install compatible BMC firmware versions.**
Green	**The system is operating normally**	**None.**
Blinking green	**System is operating simplexed. Taking it offline will crash the system.**	**Restore offline enclosure to service.**
Amber	**The system has a critical condition (e.g., over-temperature condition).**	**Refer to system administration documentation to identify the critical condition and take actions to correct it.**
Blinking amber	**On a single core I/O enclosure: The system has a noncritical warning condition (e.g., a secondary BMC failure).**	**Refer to system administration documentation to identify the critical condition and take actions to correct it.**
	On both core I/O enclosures: the system clock card has failed.	**Shut down system and replace the clock card.**
Clear (unlit	**Power to the primary I/O enclosure, and therefore to the system is off. (The secondary BMC is off when the primary I/O enclosure is operating.)**	**Check that the enclosure is inserted correctly. Verify that power cords are connected, or take other measures to supply power.**

2.3.2.2 Core I/O Enclosure Status LEDs

Each core I/O enclosure includes two pairs of LEDs to describe the status of the enclosure: one in the front and one in the back of each enclosure. Each pair consists of one red LED and one green-yellow LED.

The following table describes the core I/O enclosure LED states.

LED	Meaning	Action
Red	**Enclosure is broken.**	**Replace I/O enclosure.**
Red and Green	**Testing.**	**Wait.**
Green	**Enclosure is running duplexed.**	**None.**
Amber	**Enclosure is running simplexed. Taking it offline will crash the system.**	**Restore offline I/O enclosure to service.**
Clear (unlit)	**Standby power is off.**	**Verify that power cords are connected, or take other measures to supply power to the system.**

2.3.2.3 Disk Activity LED

A single red-green LED indicates the status of disk activity of all of the disks within that core I/O enclosure. This LED is different from the LEDs on the individual SCSI disk drives.

The following table describes the Disk Activity LED states.

LED	Meaning	Action
Blinking green	**Disk activity in one or more SCSI disk.**	**None.**
Amber	**Disk fault in one or more SCSI disk.**	**Determine which disk has the fault. Verify that it is properly installed. If necessary, replace the disk.**

2.3.2.4 SCSI Disk-Drive LEDs

Each core I/O enclosure supports three SCSI disks. Each SCSI disk has a single green-amber LED on its front side.

The following table explains the SCSI disk LED states.

LED	Meaning	Action
Green	**Disk and power are present.**	**None**
Blinking green	**Disk activity.**	**None.**
Amber	**Disk error.**	**Verify that the disk is properly installed. If necessary, replace the disk.**

2.3.2.5 PCI Slot Status LEDs

The core I/O enclosure contains three, single, bicolor (red-amber) LEDs to describe the status of each of the three PCI slots within that enclosure. The three LEDs are only at the rear of the enclosure.

The following table describes the PCI slot status LEDs.

LED	Meaning	Action
Red	**The PCI adapter is broken.**	**Replace the PCI adapter.**
Amber	**The PCI adapter is operating simplexed. Taking it offline will result in lost connectivity.**	**Insert identical adapter in corresponding slot in the other I/O enclosure.**
Clear (unlit)	**The PCI slot is operating duplexed, or is empty.**	**if the PCI slot is operating duplexed, take no action.**

2.3.2.6 Ethernet LEDs

Each core I/O enclosure contains two Ethernet ports: a 10/100 Mbit port and a 100/1000 Mbit port. Each of these ports has two integrated LEDs: a green and an amber. The Ethernet ports and their LEDs are located at the rear of the enclosure. The 10/100 Mbit port is on the right; the 100/1000 Mbit port is on the left.

The following table describes the ethernet LEDs.

LED	Meaning	Action
Green	**Connection or activity taking place**	**None**
Blinking green	**Receiving or transmitting data.**	**None.**
Amber	**10/100 Mb port: 100 Mb connection speed.** **100/1000 Mb port: 1000 Mb connection speed.** **Connection or activity.**	**None.**

2.3.2.7 CD-ROM Drive LED

The CD-ROM drive has a single LED (the Busy Indicator) that indicates whether the drive is busy. It does not have an LED that indicates whether a fault has occurred.

2.3.3 DC/AC Inverter LEDs

The DC/AC inverter front panel contains a red LED and a green LED. The following table describes their functions.

Red LED	Green LED	Function
ON	**OFF**	**A continuously incompatible operating condition exists and an alarm has tripped. The inverter is automatically turned off until the fault/alarm has been cleared.**
OFF	**ON**	**Regular operating conditions. Output is on and delivering power.**
OFF	**fast flashing**	**Self-Diagnostic mode. Prior to enabling the inverter the unit always performs a self-check and diagnostics.**
OFF	**slow-short flash**	**Stand-by mode.**

The following table lists steps for diagnosing DC/AC inverter problems.

Symptom	Check	Further Checks and Corrections
No output. No front panel indication.	**Is input breaker and power to rack enabled?**	**Check for availability of power source.**
	Is unit fully recessed and secured in rack?	
	Is power switch ON?	
Red LED on. No output	**Is input voltage within working range?**	**Verify input voltage is within - 35 V to - 75 V**
	Are fans operating continuously at high speed?	**Check if ambient temperature is within 0 – 50°C.**
	Internal module fault.	
Unit cycles on/off. Green LED – steady blink briefly each time prior to turning on.	**Check for load fault.**	**Ensure no overload or short circuit condition is present at output.**
	Internal module fault?	
No output. Green LED – short blink at a slow rate (approx. 1/sec.)	**Unit in shut down?**	**Check status of signal on shutdown pin on user port or query same status using Ethernet if equipped with one.**
	Is unit fully recessed and secured in rack?	**If connectors don't make full contact, the unit remains shutdown.**
	Internal module fault.	

2.4 ftmaint Command

ftmaint is a Stratus ft Linux hardware administration tool that allows a user with root privilege to add and remove fault tolerant hardware from the command line. It allows the addition, removal, status checking, active compatibility switch, and diagnostic analysis of fault tolerant hardware components.

USAGE

ftmaint [--nowait] <command< <hardware path>

where **--nowait** allows **ftmaint** to be run as a background process. By default, **ftmaint** runs in the foreground and waits until all screen output is completed before returning to the command line.

SUPPORTED COMMANDS

The following commands can be issued with **ftmaint**:

down – Removes a device from the system.

up - Adds a device to the system.

status - Reads current hardware and operational state of a device.

diag - performs a diagnostic and returns diagnostic information about the device specified by the hardware path. Optionally, you can specify 'all' as the hardware path of the device in order to determine the status of all connected devices. (PCI diagnostics are not currently implemented.)

ac - Switches the active compatibility.

mtbf - resets the MTBF count for the device specified.

help – displays the information shown here.

To view a typical listing of the system components, enter the following command:

ftmaint status all

A sample display is shown on the following pages.

```
performing status request on all
cpu bucket 0
opstate = DUPLEX
state = ONLINE

cpu bucket 0 dimm
dimm 0
  valid             true
  device_path_id    [0/0]
  spd_revision      00
  mfg_id            127 145 0 0 0 0 0 0
  mfg_location      00
  mfg_part_number   ^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@
  revision          0000
  mfg_date          0000
  serial_number     0
  memory_type       unknown
  error_correction ECC
  reason                          none
  ecc_threshold_exceeded        0
  ecc_soft_errors               0
  ecc_intermittent_hard_errors 0
  self_refresh      true
  refresh_rate      7.8us
  clock_frequency   0Mhz
  size              512MB
dimm 1
  valid             true
  device_path_id    [0/1]
  spd_revision      00
  mfg_id            127 145 0 0 0 0 0 0
  mfg_location      00
  mfg_part_number   ^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@
  revision          0000
  mfg_date          0000
  serial_number     0
  memory_type       unknown
  error_correction ECC
  reason                          none
  ecc_threshold_exceeded        0
```

```
  ecc_soft_errors              0
  ecc_intermittent_hard_errors 0
  self_refresh     true
  refresh_rate     7.8us
  clock_frequency  0Mhz
  size             512MB
dimm 2
  valid            true
  device_path_id   [0/2]
  spd_revision     00
  mfg_id           127 145 0 0 0 0 0 0
  mfg_location     00
  mfg_part_number  ^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@
  revision         0000
  mfg_date         0000
  serial_number    0
  memory_type      unknown
  error_correction ECC
  reason                       none
  ecc_threshold_exceeded       0
  ecc_soft_errors              0
  ecc_intermittent_hard_errors 0
  self_refresh     true
  refresh_rate     7.8us
  clock_frequency  0Mhz
  size             512MB
dimm 3
  valid            true
  device_path_id   [0/3]
  spd_revision     00
  mfg_id           127 145 0 0 0 0 0 0
  mfg_location     00
  mfg_part_number  ^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@^@
  revision         0000
  mfg_date         0000
  serial_number    0
  memory_type      unknown
  error_correction ECC
  reason                       none
  ecc_threshold_exceeded       0
```

```
  ecc_soft_errors              0
  ecc_intermittent_hard_errors 0
  self_refresh     true
  refresh_rate     7.8us
  clock_frequency  0Mhz
  size             512MB
dimm 4
  valid            false
  device_path_id   [0/4]
dimm 5
  valid            false
  device_path_id   [0/5]

cpu bucket 0 processor
cpu 0
  valid                           true
  device_path_id                  [0/20]
  qdf_number                       SL6EP
  type                            0
  model                           12
  frequency                       2400
  high_core_voltage_tolerance     0
  low_core_voltage_tolerance      0
  l2_cache_size                   512
  l2sram_components               0
  l2_cache_voltage_tolerance      0
  high_l2_cache_voltage_tolerance 0
  low_l2_cache_voltage_tolerance  0
  cartridge_revision               1.0
  cartridge_substrate_revision_id 0
  part_number                     80532KC
  bomid                           0
  serial_number                   36230137217601969
  thermal_reference               72
  oem_eeprom                      0
cpu 1
  valid                           true
  device_path_id                  [0/21]
  qdf_number                       SL6EP
  type                            0
```

```
  model                           12
  frequency                       2400
  high_core_voltage_tolerance     0
  low_core_voltage_tolerance      0
  l2_cache_size                   512
  l2sram_components               0
  l2_cache_voltage_tolerance      0
  high_l2_cache_voltage_tolerance 0
  low_l2_cache_voltage_tolerance  0
  cartridge_revision               1.0
  cartridge_substrate_revision_id 0
  part_number                     80532KC
  bomid                           0
  serial_number                   36230137217601969
  thermal_reference               72
  oem_eeprom                      0
cpu 2
  valid                           true
  device_path_id                  [0/22]
  qdf_number                       SL6EP
  type                            0
  model                           12
  frequency                       2400
  high_core_voltage_tolerance     0
  low_core_voltage_tolerance      0
  l2_cache_size                   512
  l2sram_components               0
  l2_cache_voltage_tolerance      0
  high_l2_cache_voltage_tolerance 0
  low_l2_cache_voltage_tolerance  0
  cartridge_revision               1.0
  cartridge_substrate_revision_id 0
  part_number                     80532KC
  bomid                           0
  serial_number                   54079620713225982
  thermal_reference               72
  oem_eeprom                      0
cpu 3
  valid                           true
  device_path_id                  [0/23]
```

```
  qdf_number                       SL6EP
  type                             0
  model                            12
  frequency                        2400
  high_core_voltage_tolerance      0
  low_core_voltage_tolerance       0
  l2_cache_size                    512
  l2sram_components                0
  l2_cache_voltage_tolerance       0
  high_l2_cache_voltage_tolerance  0
  low_l2_cache_voltage_tolerance   0
  cartridge_revision               1.0
  cartridge_substrate_revision_id  0
  part_number                      80532KC
  bomid                            0
  serial_number                    54079620713225982
  thermal_reference                72
  oem_eeprom                       0
cpu 4
  valid                            false
  device_path_id                   [0/24]
cpu 5
  valid                            false
  device_path_id                   [0/25]
cpu 6
  valid                            false
  device_path_id                   [0/26]
cpu 7
  valid                            false
  device_path_id                   [0/27]
cpu 8
  valid                            false
  device_path_id                   [0/28]
cpu 9
  valid                            false
  device_path_id                   [0/29]
cpu 10
  valid                            false
  device_path_id                   [0/30]
cpu 11
```

```
  valid                         false
  device_path_id                [0/31]
cpu 12
  valid                         false
  device_path_id                [0/32]
cpu 13
  valid                         false
  device_path_id                [0/33]
cpu 14
  valid                         false
  device_path_id                [0/34]
cpu 15
  valid                         false
  device_path_id                [0/35]
cpu 16
  valid                         false
  device_path_id                [0/36]
cpu 17
  valid                         false
  device_path_id                [0/37]
cpu 18
  valid                         false
  device_path_id                [0/38]
cpu 19
  valid                         false
  device_path_id                [0/39]
cpu 20
  valid                         false
  device_path_id                [0/40]
cpu 21
  valid                         false
  device_path_id                [0/41]
cpu 22
  valid                         false
  device_path_id                [0/42]
cpu 23
  valid                         false
  device_path_id                [0/43]
cpu 24
  valid                         false
```

```
  device_path_id                  [0/44]
cpu 25
  valid                           false
  device_path_id                  [0/45]
cpu 26
  valid                           false
  device_path_id                  [0/46]
cpu 27
  valid                           false
  device_path_id                  [0/47]
cpu 28
  valid                           false
  device_path_id                  [0/48]
cpu 29
  valid                           false
  device_path_id                  [0/49]
cpu 30
  valid                           false
  device_path_id                  [0/50]
cpu 31
  valid                           false
  device_path_id                  [0/51]


cpu bucket 1
opstate = UNKNOWN
state = MISSING

cpu bucket 1 dimm
dimm 0
  valid             false
  device_path_id    [1/0]
dimm 1
  valid             false
  device_path_id    [1/1]
dimm 2
  valid             false
  device_path_id    [1/2]
dimm 3
  valid             false
```

```
  device_path_id   [1/3]
dimm 4
  valid            false
  device_path_id   [1/4]
dimm 5
  valid            false
  device_path_id   [1/5]

cpu bucket 1 processor
cpu 0
  valid                          false
  device_path_id                 [1/20]
cpu 1
  valid                          false
  device_path_id                 [1/21]
cpu 2
  valid                          false
  device_path_id                 [1/22]
cpu 3
  valid                          false
  device_path_id                 [1/23]
cpu 4
  valid                          false
  device_path_id                 [1/24]
cpu 5
  valid                          false
  device_path_id                 [1/25]
cpu 6
  valid                          false
  device_path_id                 [1/26]
cpu 7
  valid                          false
  device_path_id                 [1/27]
cpu 8
  valid                          false
  device_path_id                 [1/28]
cpu 9
  valid                          false
  device_path_id                 [1/29]
cpu 10
```

```
  valid                         false
  device_path_id                [1/30]
cpu 11
  valid                         false
  device_path_id                [1/31]
cpu 12
  valid                         false
  device_path_id                [1/32]
cpu 13
  valid                         false
  device_path_id                [1/33]
cpu 14
  valid                         false
  device_path_id                [1/34]
cpu 15
  valid                         false
  device_path_id                [1/35]
cpu 16
  valid                         false
  device_path_id                [1/36]
cpu 17
  valid                         false
  device_path_id                [1/37]
cpu 18
  valid                         false
  device_path_id                [1/38]
cpu 19
  valid                         false
  device_path_id                [1/39]
cpu 20
  valid                         false
  device_path_id                [1/40]
cpu 21
  valid                         false
  device_path_id                [1/41]
cpu 22
  valid                         false
  device_path_id                [1/42]
cpu 23
  valid                         false
```

```
  device_path_id                  [1/43]
cpu 24
  valid                           false
  device_path_id                  [1/44]
cpu 25
  valid                           false
  device_path_id                  [1/45]
cpu 26
  valid                           false
  device_path_id                  [1/46]
cpu 27
  valid                           false
  device_path_id                  [1/47]
cpu 28
  valid                           false
  device_path_id                  [1/48]
cpu 29
  valid                           false
  device_path_id                  [1/49]
cpu 30
  valid                           false
  device_path_id                  [1/50]
cpu 31
  valid                           false
  device_path_id                  [1/51]

pci buckets

Xena 0 ONLINE      ACTIVE COMPAT
Xena 1 ONLINE

bb:dd.f Xena Slot HW Opstate Probed Name
-----------------------------------------
01:00.0  0   1  ONLINE SIMPLEX  Y  Chips and Technologies F69000 HiQVideo
01:01.0  0   2 MISSING   EMPTY
01:02.0  0   3 MISSING   EMPTY
01:03.0  0   4  ONLINE SIMPLEX  Y  Intel Corp. 82544GC Gigabit Ethernet Controller
01:0f.0  0   5  ONLINE  DUPLEX  N  ServerWorks CSB5 South Bridge (#2)
01:0f.1  0   5  ONLINE  DUPLEX  Y  ServerWorks CSB5 IDE Controller
01:0f.2  0   5  ONLINE  DUPLEX  Y  ServerWorks OSB4/CSB5 OHCI USB Controller
```

```
01:0f.3  0   5  ONLINE  DUPLEX  N  ServerWorks CSB5-LPC
01:05.0  0   6  ONLINE SIMPLEX  Y  QLogic Corp. QLA12160
01:06.0  0   7  ONLINE  DUPLEX  Y  Intel Corp. 82557 [Ethernet Pro 100]
----------------------------------------
40:00.0  1   1 MISSING   EMPTY
40:01.0  1   2 MISSING   EMPTY
40:02.0  1   3 MISSING   EMPTY
40:03.0  1   4  ONLINE SIMPLEX  Y  Intel Corp. 82544GC Gigabit Ethernet Controller
(#2)
40:0f.0  1   5  ONLINE  DUPLEX  N  ServerWorks CSB5 South Bridge (#3)
40:0f.1  1   5  ONLINE  DUPLEX  Y  ServerWorks CSB5 IDE Controller (#2)
40:0f.2  1   5  ONLINE  DUPLEX  Y  ServerWorks OSB4/CSB5 OHCI USB Controller (#2)
40:0f.3  1   5  ONLINE  DUPLEX  N  ServerWorks CSB5-LPC (#2)
40:05.0  1   6  ONLINE SIMPLEX  Y  QLogic Corp. QLA12160 (#2)
40:06.0  1   7  ONLINE  DUPLEX  Y  Intel Corp. 82557 [Ethernet Pro 100] (#2)

scsi
Attached domains:
  Domain 1 deferred_first_path_del 0 seconds (disabled).
  Domain 1 transient_failure_wait 0 seconds (disabled).
  Domain 1 attached hosts:
    Host: 0 ONLINE
    QLogic QLA12160  PCI to SCSI Host Adapter: bus 01 device 05 irq 37
       Firmware version: 10.04.39, Driver version 3.23.1-Stratus
    Host: 1 ONLINE
    QLogic QLA12160  PCI to SCSI Host Adapter: bus 40 device 05 irq 42
       Firmware version: 10.04.39, Driver version 3.23.1-Stratus
  Domain 1 attached devices:
    Device: 0 ONLINE  sda usage: 7
    Vendor: SEAGATE  Model: ST373307LC       Rev: 9B05
    Type:   Direct-Access                    ANSI SCSI revision: 03
    Serial #: 3HZ0DH2B00007320AX0X
      Host: scsi0 Channel: 00 Id: 00 Lun: 00
    Device: 1 ONLINE  sdb usage: 0
    Vendor: SEAGATE  Model: ST336607LC       Rev: 9B05
    Type:   Direct-Access                    ANSI SCSI revision: 03
    Serial #: 3JA03XPF0000732148T7
      Host: scsi0 Channel: 00 Id: 01 Lun: 00
    Device: 2 ONLINE
    Vendor: NEC      Model: GEM359SES SONIC  Rev: 1.03
```

```
Type:   Enclosure                       ANSI SCSI revision: 04
Serial #: scsitopo0000001
  Host: scsi0 Channel: 00 Id: 08 Lun: 00
Device: 3 ONLINE  sdf usage: 0
Vendor: SEAGATE  Model: ST336607LC      Rev: 9B05
Type:   Direct-Access                   ANSI SCSI revision: 03
Serial #: 3JA03ANS00007304E968
  Host: scsi1 Channel: 00 Id: 02 Lun: 00
Device: 4 ONLINE
Vendor: NEC      Model: GEM359SES SONIC  Rev: 1.03
Type:   Enclosure                       ANSI SCSI revision: 04
Serial #: scsitopo0000002
  Host: scsi1 Channel: 00 Id: 08 Lun: 00
Device: 5 ONLINE  sde usage: 7
Vendor: SEAGATE  Model: ST373307LC      Rev: 9B05
Type:   Direct-Access                   ANSI SCSI revision: 03
Serial #: 3HZ0CTFZ0000731806A3
  Host: scsi1 Channel: 00 Id: 01 Lun: 00
```

3. CRU Hardware Removal and Replacement Procedures

This section lists the Customer Replaceable Units (CRUs) in the ftServer T30 system and describes the removal and replacement procedures for each one.

3.1 List of CRUs

The following table lists the CRUs in the ftServer T30 system.

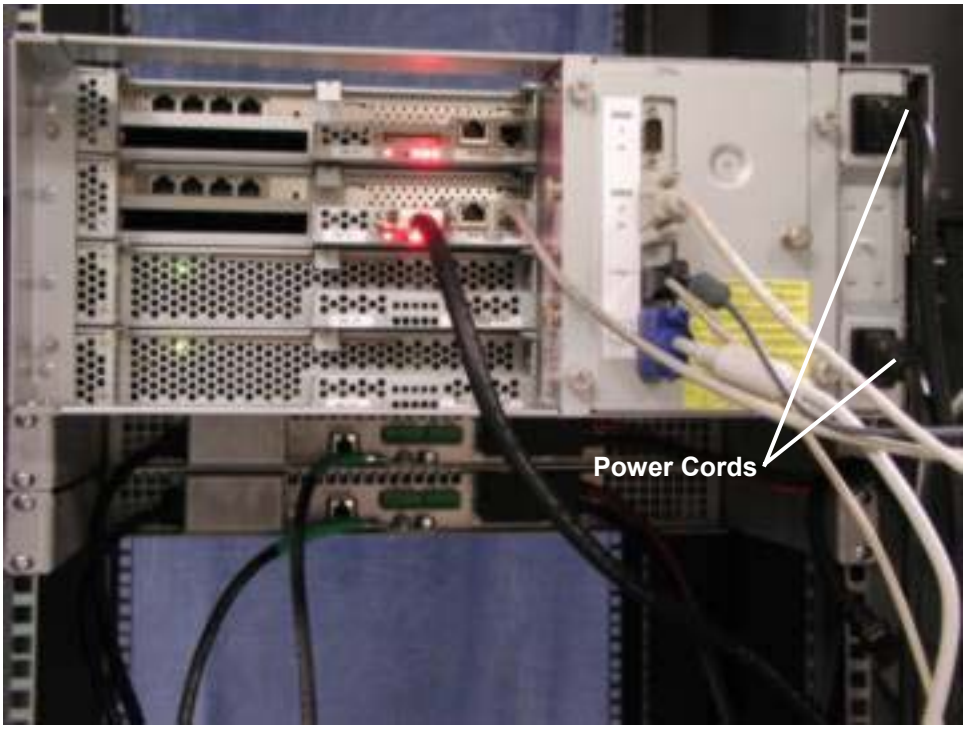
Description	Part Number
CPU Enclosure	**AA-G93300**
Core I/O Enclosure	**AA-E90500**
CPU Enclosure Power Supply	**AA-P70300**
CPU or Core I/O Enclosure LED Board Assembly	**AA-E70700/AA-E70600**
PCI Adapter	**AA-UXXX00**
Core I/O Enclosure Disk Drive	**AA-D53X**
Core I/O Enclosure CD ROM Drive	**AA-D55100**
Clock Card	**AA-E70300**
Connector I/O Board	**AA-E70100**
4 U Backplane Assembly	**AA-E72500**
Backplane Board	**AA-E70200**
DC/AC Inverter	**AA-P70900**
CPU Enclosure Memory Module (DIMM)	**AA-M22XXX**
CPU Enclosure Power Cable	**AW-020088**
Core I/O Enclosure Fan Assembly	**MA000569**

3.2 Power Removal

If total power removal is required, the system must be shut down prior to removing power and rebooted after the replacement unit is installed.

1. Shutdown the Linux operating system.
2. Disconnect the DC power cables from the source.
3. Turn off power to the monitor and any peripheral devices.
4. At the back of the system, remove the two AC power cords from the 4U backpanel.

Figure 3-1. Power Cords



3.3 Handling ESD Sensitive Parts

Clock cards and PCI adapters are particularly sensitive to damage from electrostatic discharge (ESD) because the electronic components are exposed when the device is not fully installed.

Caution: To avoid damaging these parts during handling, always take the following precautions.

- Always store cards and adapters in their static-protective envelope until you are ready to install them in the system.
- Always hold an adapter or card by its edges.
- Always ground yourself before handling a clock card or a PCI adapter, or before removing or replacing the I/O enclosure. Ground yourself by wearing a grounding strap.

3.4 Hardware Removal Procedures

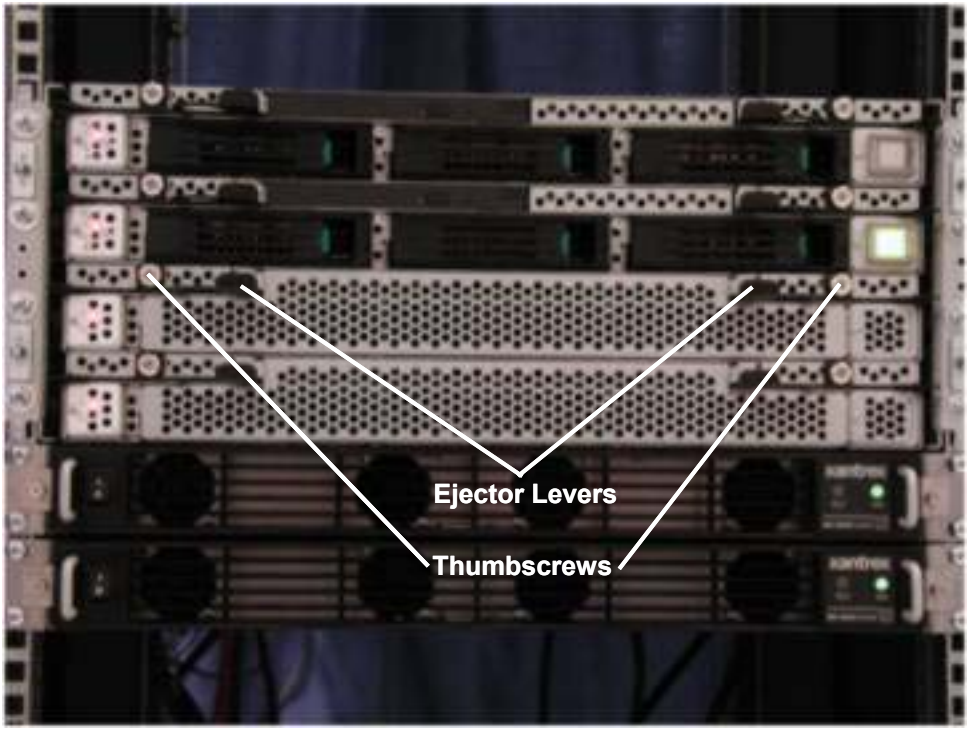
This section contains the removal procedures for the CRUs listed in the preceding table. Each of these procedures indicates any power removal requirements for the CRU.

To perform the replacement procedure for each CRU, reverse the removal procedure. If any special replacement considerations are necessary, a replacement note is included.

3.4.1 CPU Enclosure

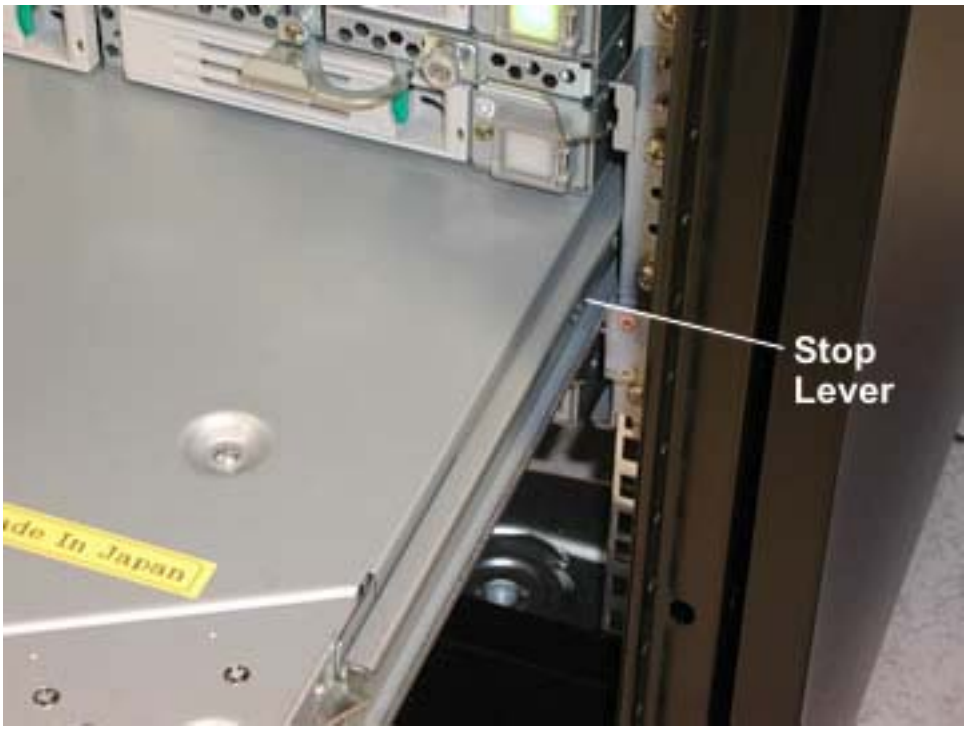
1. If the CPU enclosure is still in service, take it out of service.
2. At the front of the enclosure, loosen the two thumbscrews and open the ejector levers.

Figure 3-2. CPU Enclosure Thumbscrews and Ejector Levers



3. Carefully pull the enclosure straight out until it stops. Press down on the stop lever on the right side of the enclosure and pull the enclosure all the way out.

Figure 3-3. CPU Enclosure Stop Lever



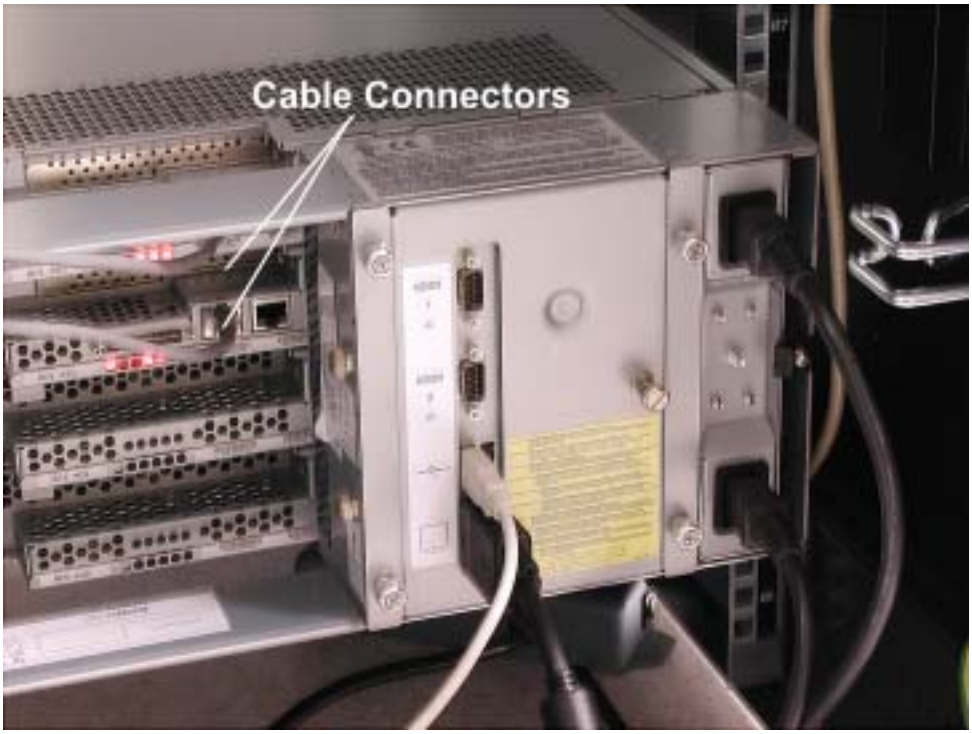
REPLACEMENT NOTE: The back left side of the enclosure (as seen from the front) is keyed to fit only into a CPU enclosure slot. Be sure that the enclosure is correctly aligned with the appropriate rails on both sides. It should be perfectly level. If you put the CPU enclosure into an I/O enclosure slot by mistake, it will be forced to a stop before being plugged into the backplane.

3.4.2 Core I/O Enclosure

1. If the I/O enclosure is still in service, take it out of service.

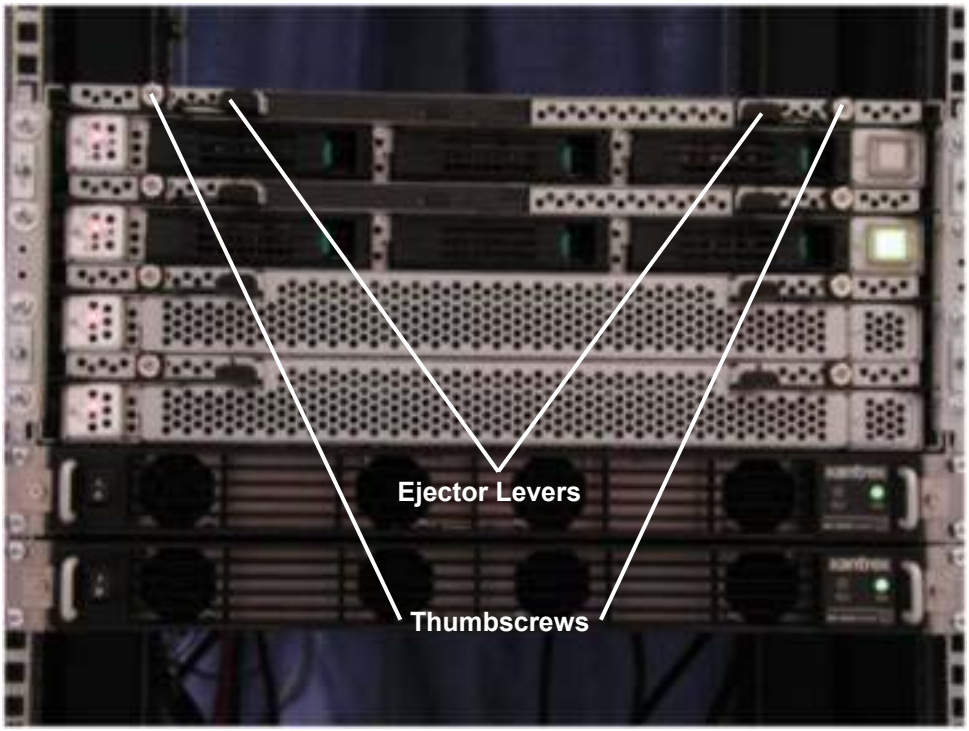
At the rear of the cabinet, disconnect all cables from the back of the I/O enclosure.

Figure 3-4. I/O Enclosure Cables



2. At the front of the enclosure, loosen the two thumbscrews on the I/O enclosure and open the ejector levers.

Figure 3-5. I/O Enclosure Thumbscrews and Ejector Levers



3. Carefully pull the enclosure straight out until it stops. Press down on the stop lever on the right side of the enclosure and pull the enclosure all the way out.

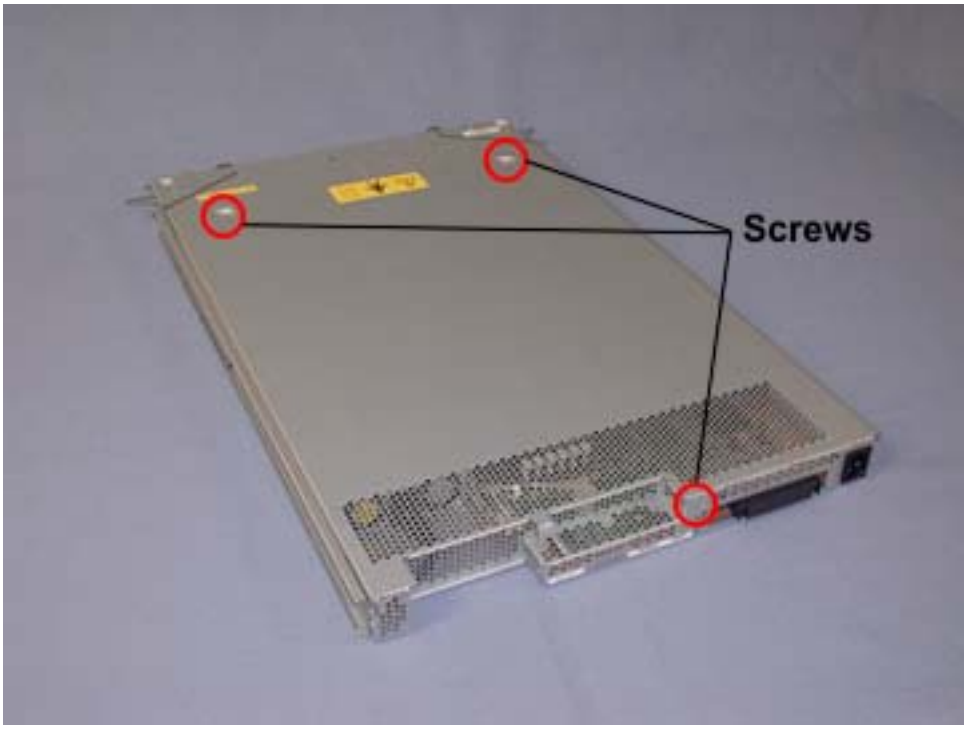
Figure 3-6. Removing I/O Enclosure

REPLACEMENT NOTE: The back of the I/O enclosure is keyed to fit only into an I/O enclosure slot. Be sure that the enclosure is correctly aligned with the appropriate rails on both sides. It should be perfectly level. If you put the I/O enclosure into a CPU enclosure slot by mistake, it will be forced to a stop before being plugged into the backplane.

3.4.3 Enclosure Cover (CPU and I/O)

1. Remove the CPU or I/O enclosure as described in Section 3.4.1 or Section 3.4.2.
2. Remove the three screws securing the enclosure cover.

Figure 3-7. Enclosure Cover Screws



3. Slide the cover straight back towards the rear of the enclosure.

Figure 3-8. Removing Enclosure Cover

REPLACEMENT NOTE: When sliding the cover onto the enclosure make sure the small tab in the center front of the cover aligns with the tab hole on the front of the enclosure frame. The four tabs on the back of the cover must align with their holes in the back of the enclosure frame. The tapered ends of the top front portion of the cover must fit beneath the tapered ends of the enclosure front frame top.

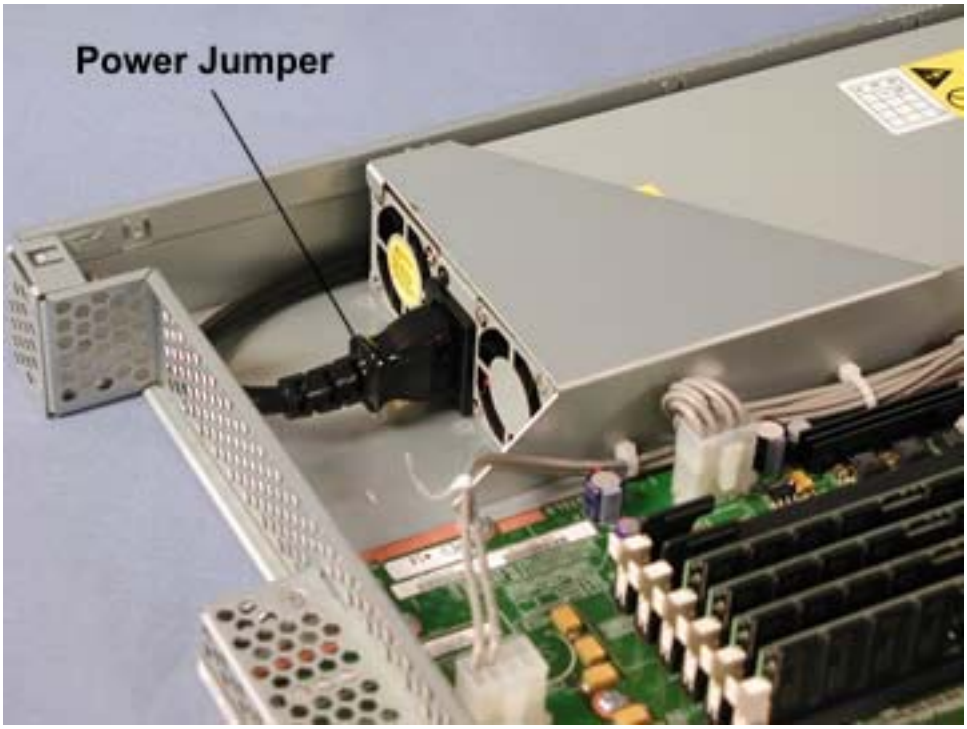
REPLACEMENT NOTE: The back left side of the CPU or I/O enclosure (as seen from the front) is keyed to fit only into a CPU or I/O enclosure slot. Be sure that the enclosure is correctly aligned with the appropriate rails on both sides. It should be perfectly level. If you put the CPU enclosure into an I/O enclosure slot by mistake, it will be forced to a stop before being plugged into the backplane.

3.4.4 CPU Enclosure Power Supply

1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.

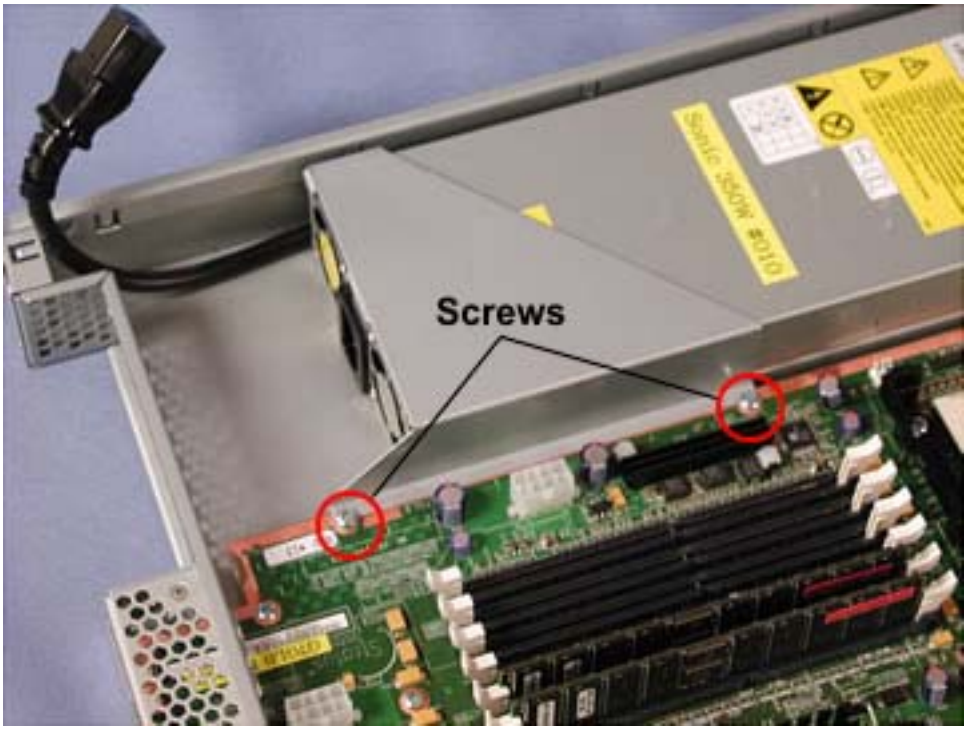
3. Disconnect the power jumper at the back of the power supply.

Figure 3-9. Power Jumper



4. Remove the two screws on the right side (from the back) of the metal bracket covering the power supply and lift the bracket off.

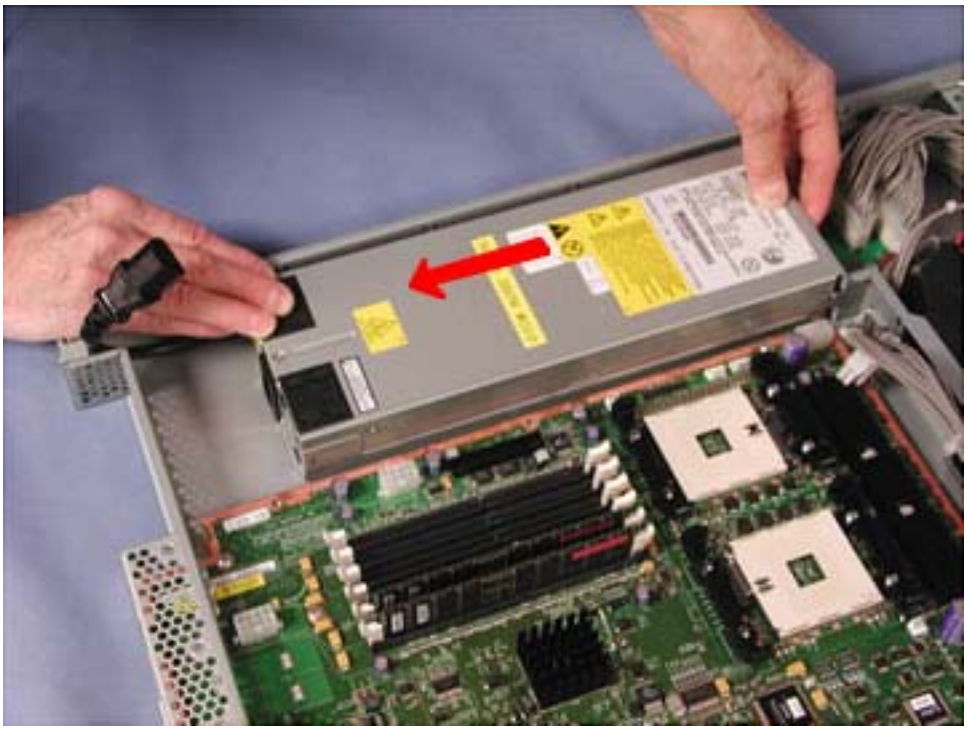
Figure 3-10. Power Supply Bracket Screws



C A U T I O N: The surface of the power supply may be hot.

5. Place one hand at the front of the power supply and push on it while pulling it the **straight** back with the other hand until it disconnects from the front connector.

Figure 3-11. Removing Power Supply

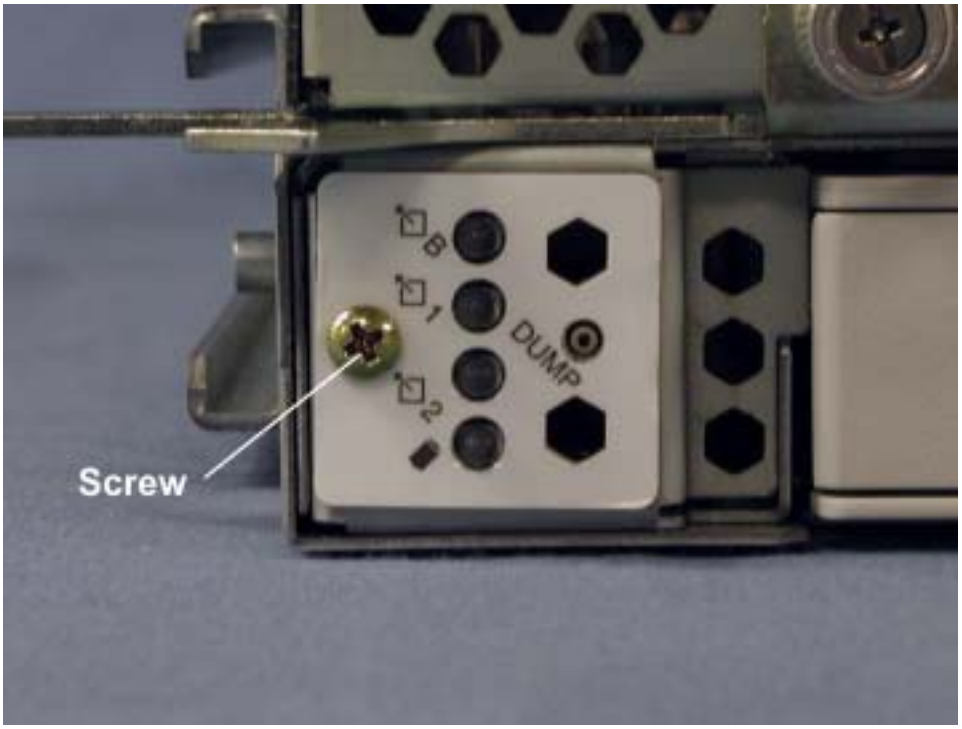


3.4.5 CPU Enclosure or I/O Enclosure LED Board Assembly

1. Remove the enclosure as described in Section 3.4.1 or 3.4.2.
2. Remove the enclosure cover as described in Section 3.4.3.

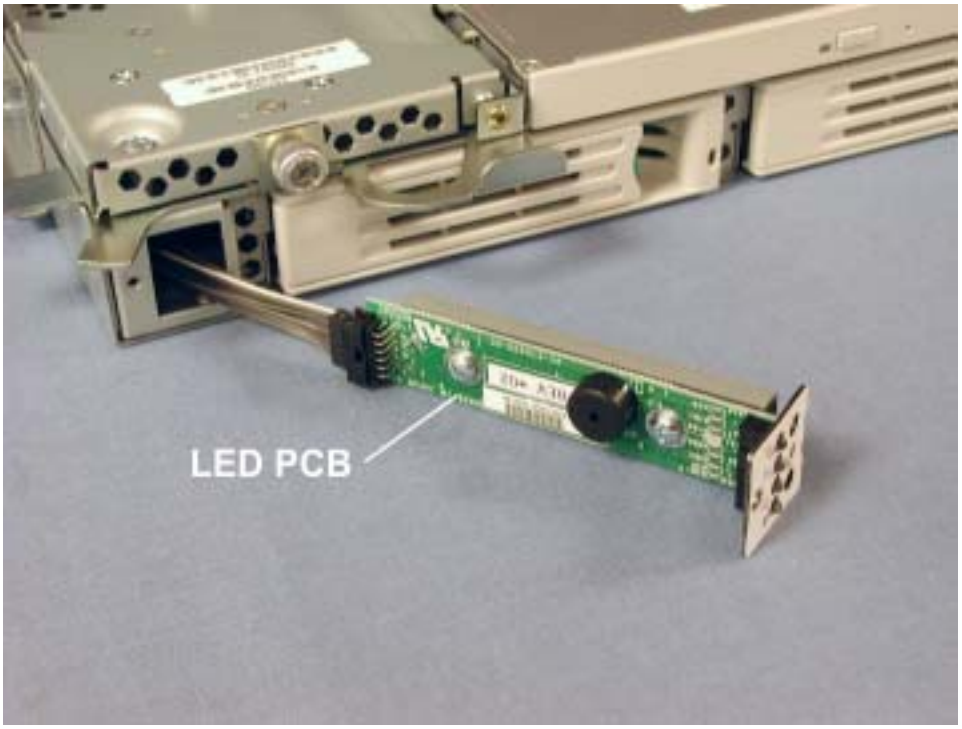
3. Remove the screw in the enclosure LED board assembly at the front of the enclosure.

Figure 3-12. Enclosure LED Board Assembly Screw



4. Pull the LED board assembly straight forward out of the enclosure until the LED cable connector is accessible. Do not pull it out any farther than is necessary to access the connector.

Figure 3-13. Removing LED Board Assembly



5. Disconnect the LED cable from the back of the LED board assembly.

3.4.6 Memory Module (DIMM)

The CPU enclosure can accommodate up to four DIMMs. DIMMs must be placed starting in DIMM slot 0 (the leftmost slot, as seen from the enclosure front) and proceeding sequentially to DIMM slot 3.

Both CPU enclosures must be configured with identical total memory size. DIMMs of different capacities and from different manufacturers may be mixed within a CPU enclosure; however DIMMs of identical capacity must be mounted in the corresponding memory slot between each CPU enclosure.

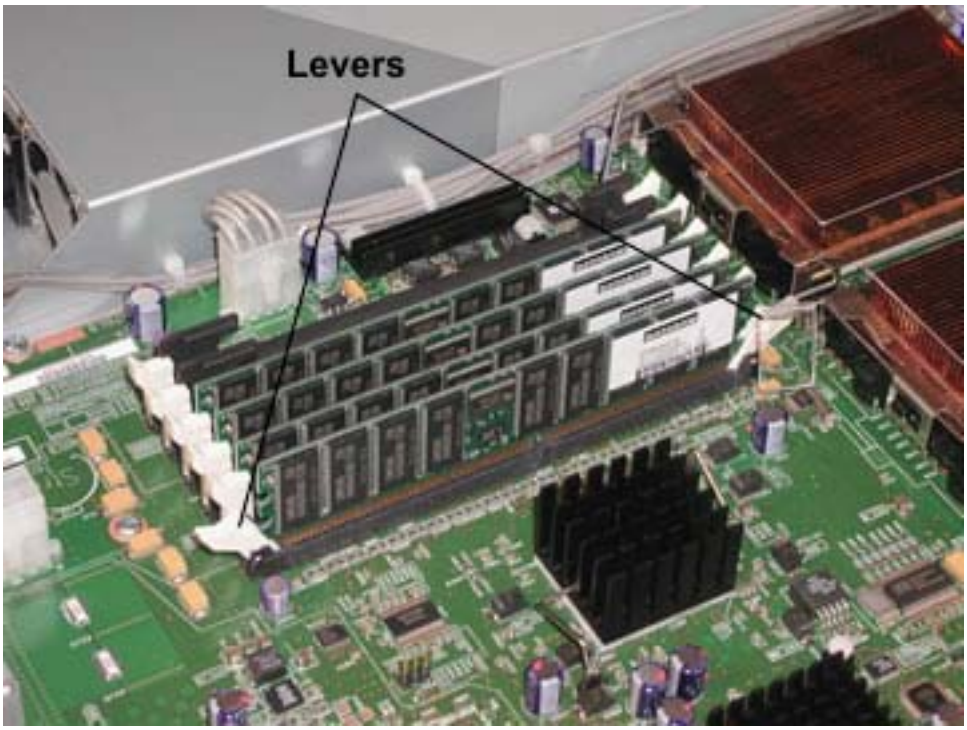
1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.

3. Remove the plastic plenum covering the processor heat sink.

Figure 3-14. Removing the Plastic Plenum

4. Push down on the two levers at the ends of the DIMM socket to release the DIMM.

Figure 3-15. Removing a DIMM



5. Pull the DIMM straight up and out of its socket.

REPLACEMENT NOTE: The DIMMs are keyed to fit only in the correct position.

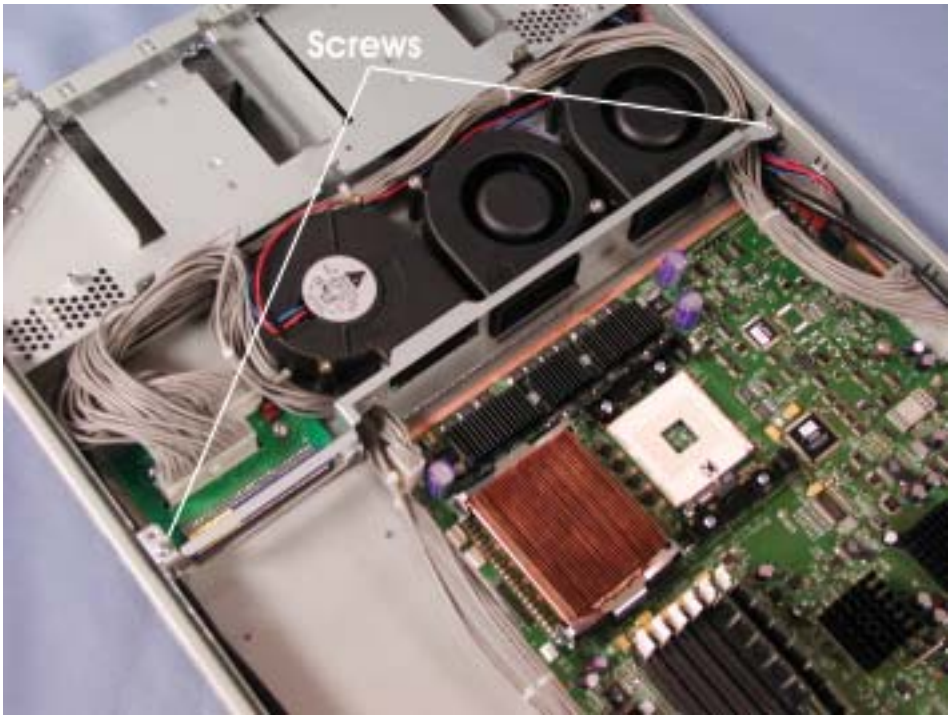
3.4.7 CPU Enclosure Power Cable

1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.
3. Remove the power supply as described in Section 3.4.4.
4. Remove the plastic plenum covering the processor heat sink.

Figure 3-16. Plastic Plenum

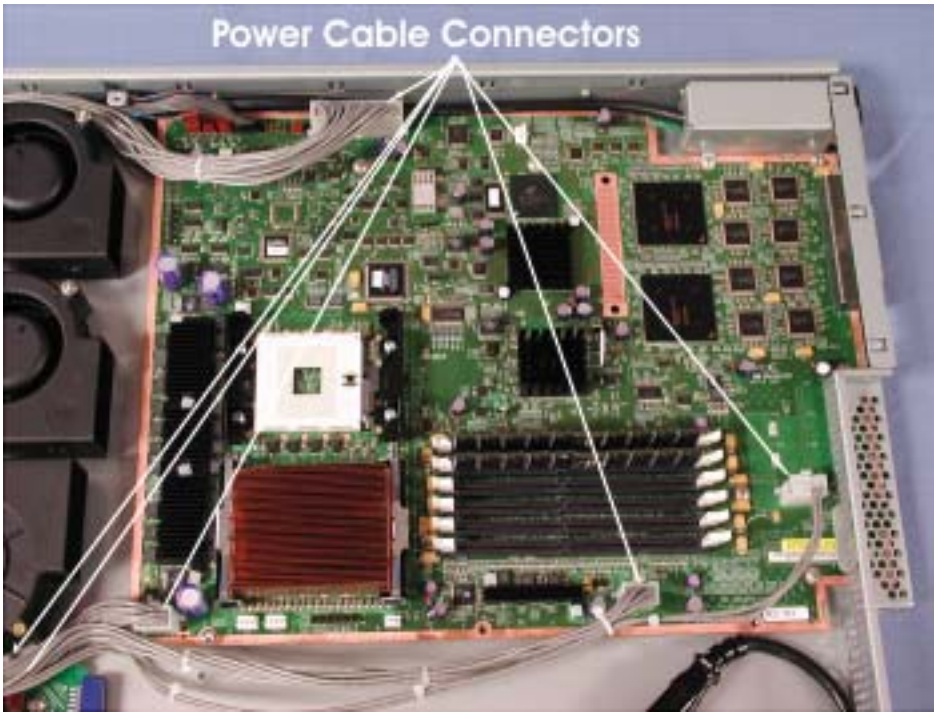
5. Remove the two screws securing the fan assembly bracket and lift it out.

Figure 3-17. Fan Assembly Bracket



6. Disconnect the power cable from the power connector board (2 connectors) and the motherboard (4 connectors).

Figure 3-18. Power Cable Connections at Power Connector Board and Motherboard

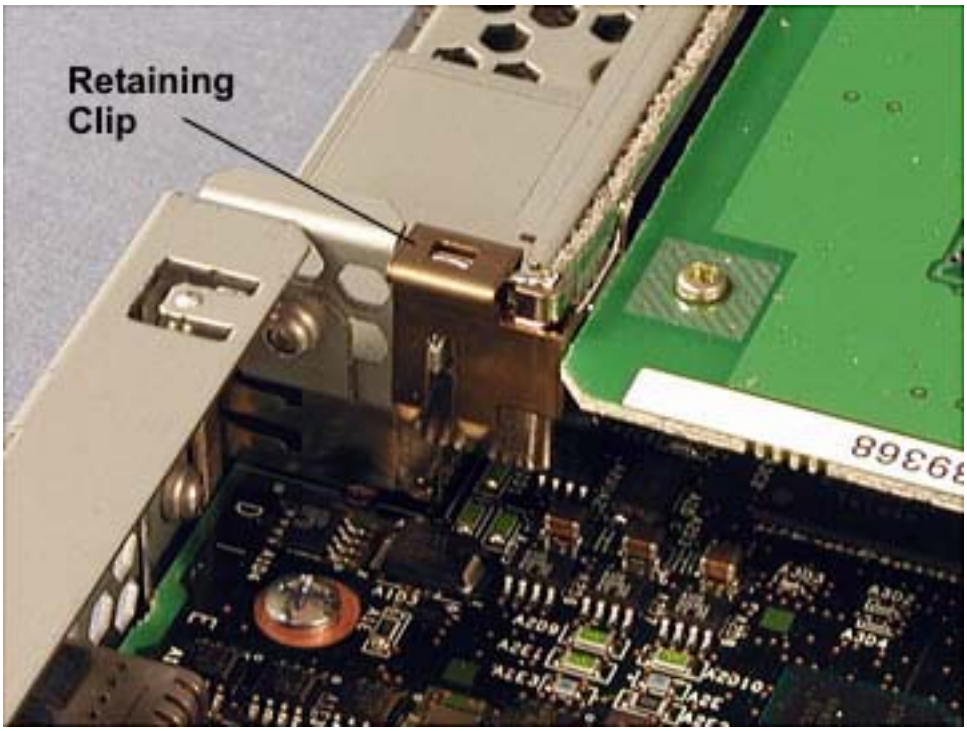


7. Carefully lift the power cable out from behind the fan assembly and out of the enclosure.

3.4.8 PCI Adapter

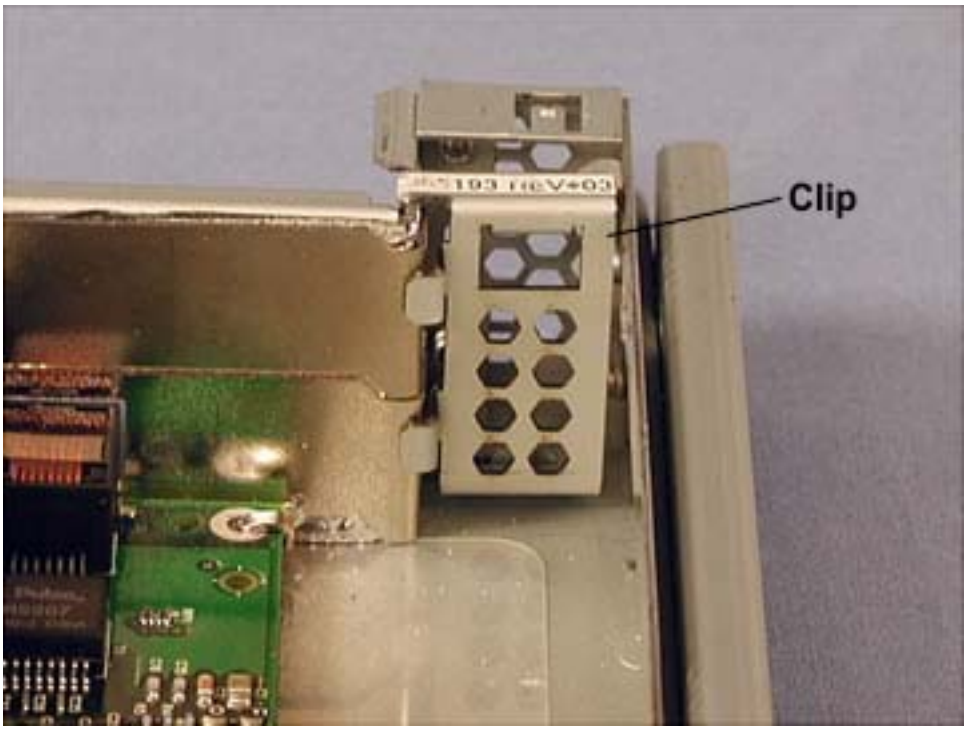
1. Remove the core I/O enclosure containing the PCI adapter as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. To remove the video adapter, remove the retaining clip securing it to the chassis.

Figure 3-19. Retaining Clip



4. To remove any of the other adapters, first remove the clip that secures the PCI adapters by pulling it straight upward.

Figure 3-20. Retaining Clip



5. Pull the PCI adapter horizontally out of its connector.

3.4.9 Core I/O Enclosure Disk Drive

The procedure assumes that the disk drive being removed is mirrored by another drive on the system.

1. Press in the tab at the end of the disk-drive lever and pull the lever out to its fully open position.

Figure 3-21. Removing a SCSI Disk Drive

2. Pull the disk drive straight out of the enclosure.

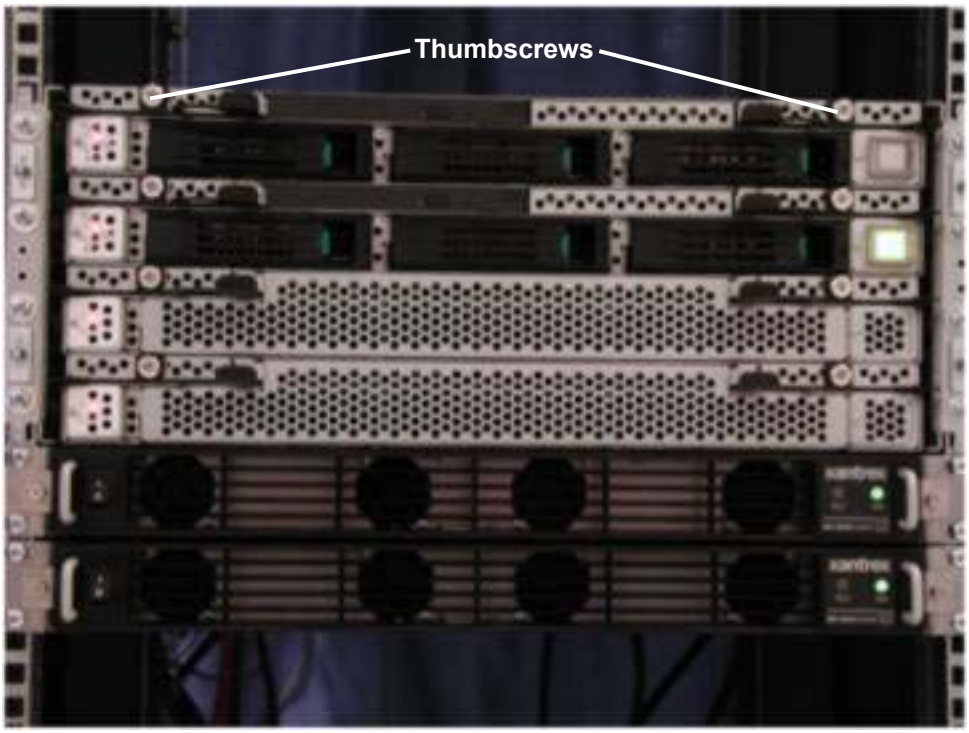
3.4.10 Core I/O Enclosure CD-ROM Drive

Before removing the CD-ROM drive from the core I/O enclosure, you must remove the I/O enclosure from service.

1. Take the core I/O enclosure containing the failed CD-ROM drive out of service. Do not remove the enclosure.

2. At the front of the I/O enclosure, loosen the two thumbscrews.

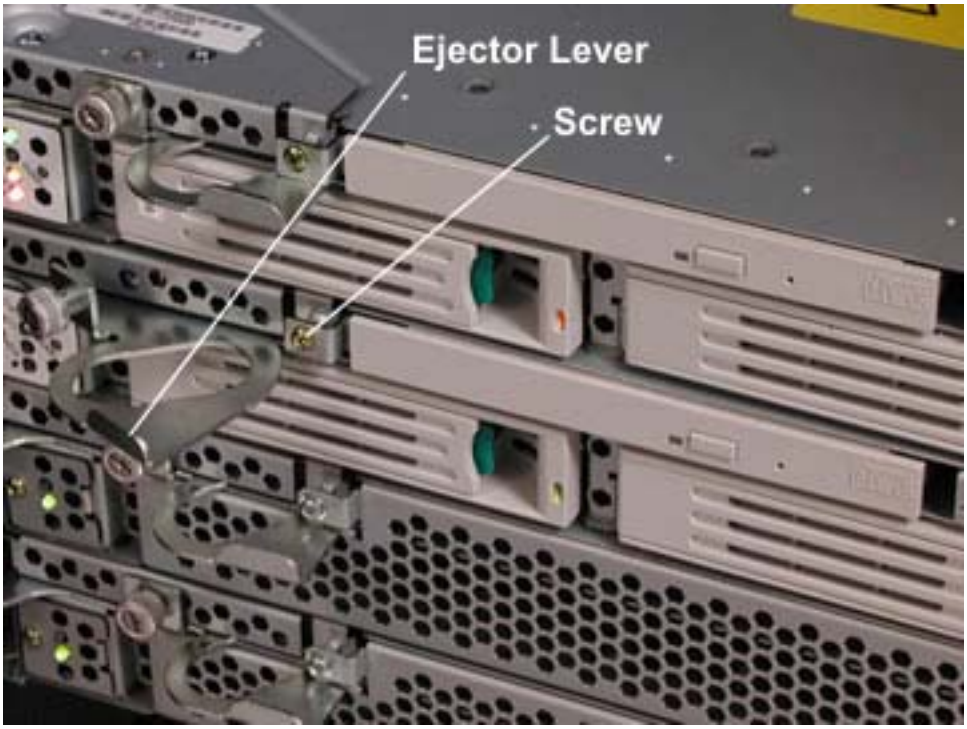
Figure 3-22. I/O Enclosure Thumbscrews



3. With the core I/O enclosure removed from service, open the enclosure's left ejector lever enough to access the screw that secures the CD-ROM drive.

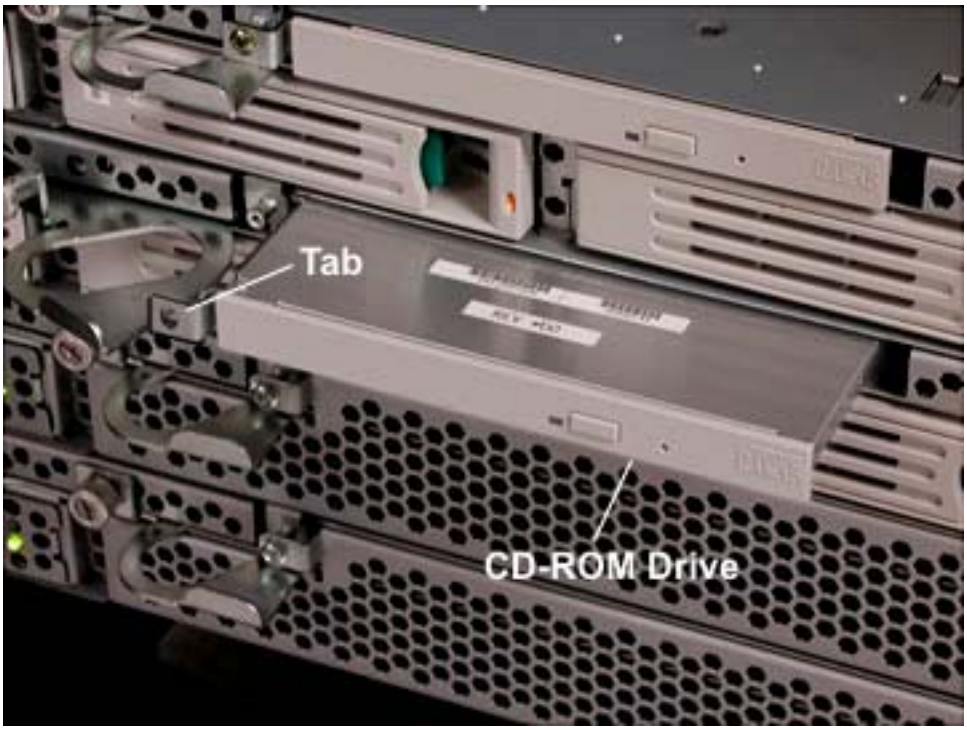
4. Remove the screw at the front of the CD-ROM drive.

Figure 3-23. I/O Enclosure Ejector Lever and CD-ROM Screw



5. Hold the tab on the left side of the CD-ROM drive and pull it out of the enclosure.

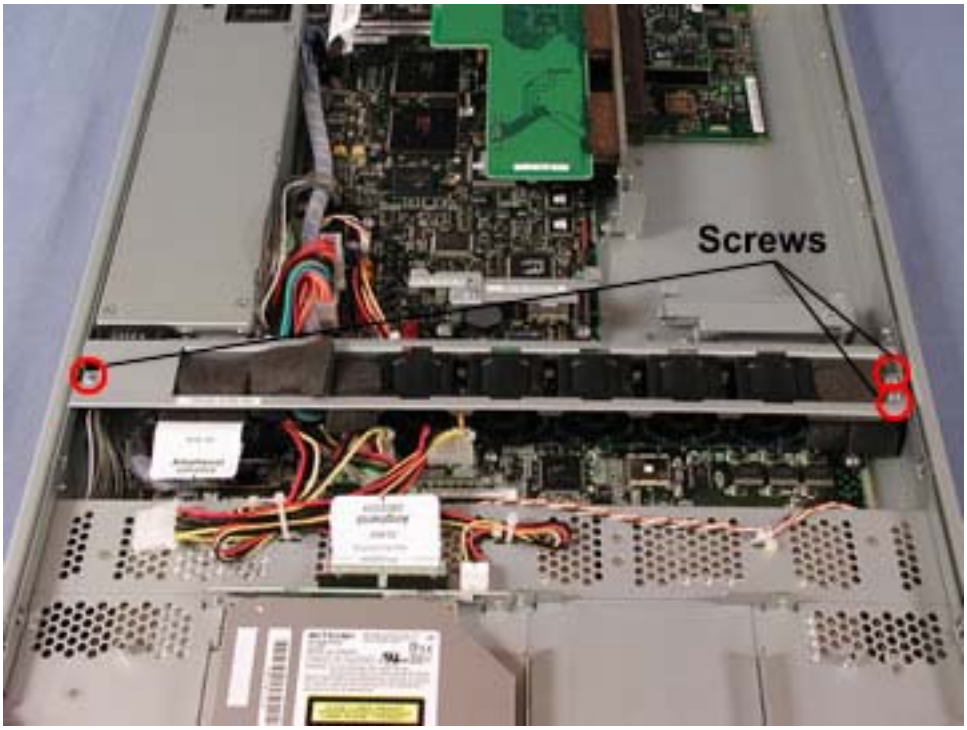
Figure 3-24. CD-ROM Tab



3.4.11 Core I/O Enclosure Fan Assembly

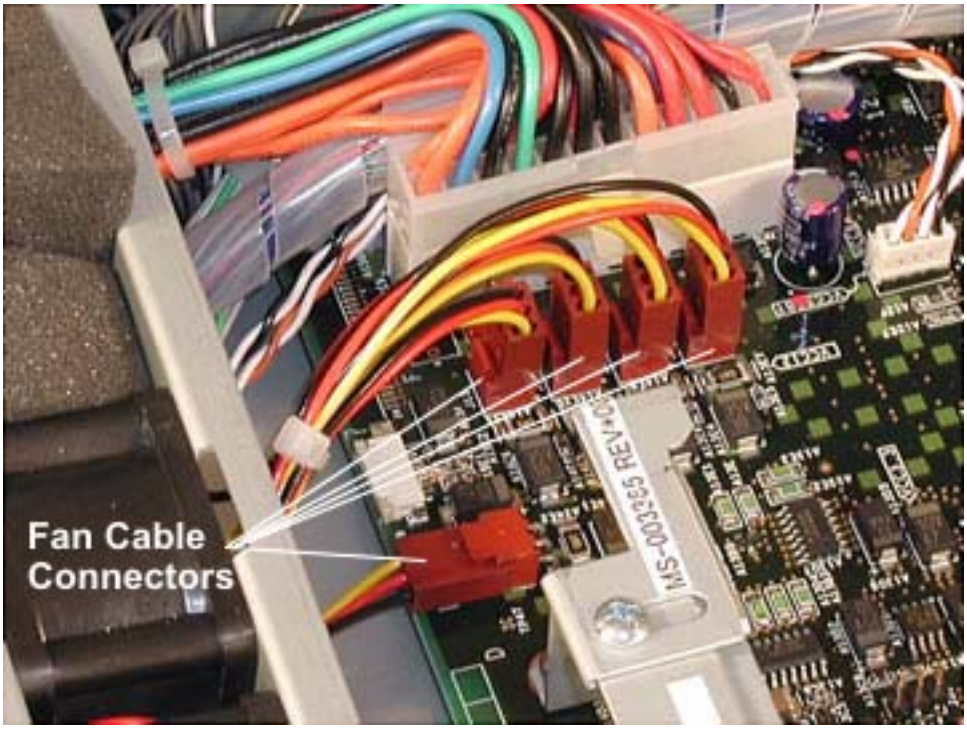
1. Remove the core I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly.

Figure 3-25. Fan Assembly Screws



4. Disconnect the five fan assembly power cables from the core I/O board.

Figure 3-26. Fan Assembly Power Cable Connections



5. Lift the fan assembly straight up to remove it from the enclosure.

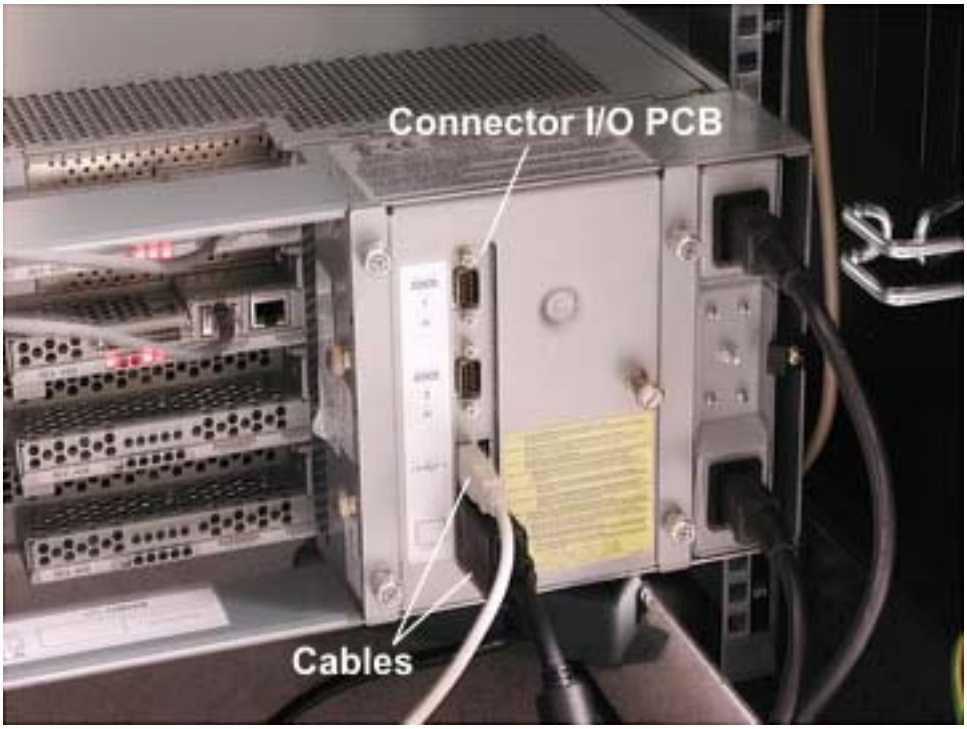
3.4.12 Clock Card

To remove the clock card, you must shut down the system and disconnect it from power.

1. Shut down the ftServer T30 system as described in Section 3.3.

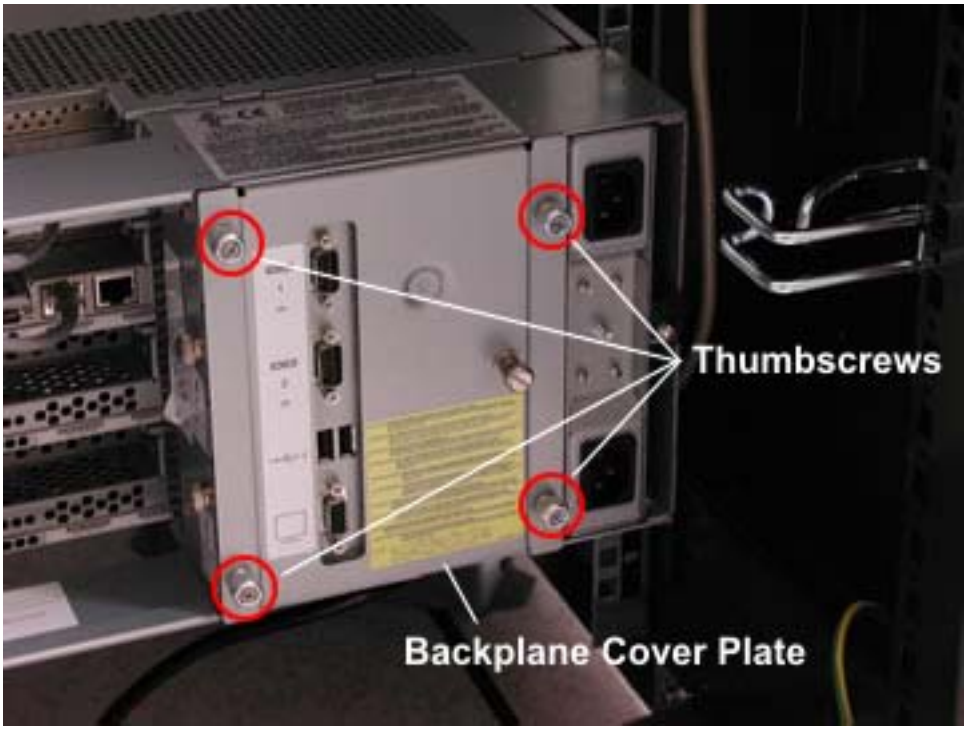
2. At the rear of the cabinet, disconnect any cables connected to the connector I/O board.

Figure 3-27. Connector I/O Board Cables



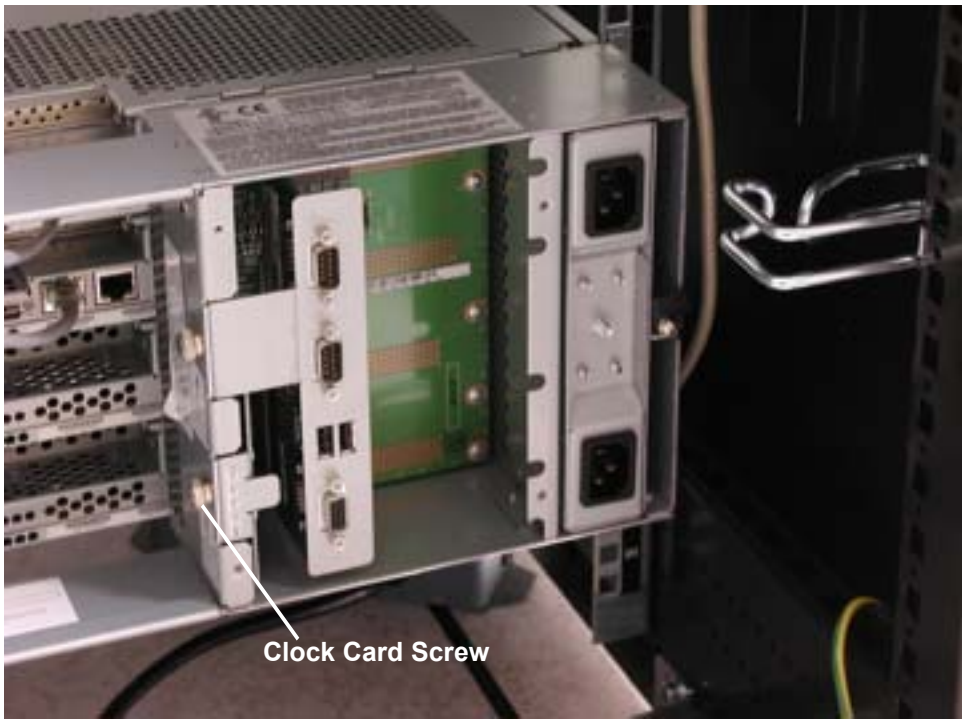
3. Unscrew the four thumbscrews on the backplane assembly cover plate and remove the cover plate.

Figure 3-28. Backplane Cover Plate Screws



4. Unscrew the thumbscrew on the lower left side of the backplane assembly. This screw secures the clock card in place.

Figure 3-29. Clock Card Screw

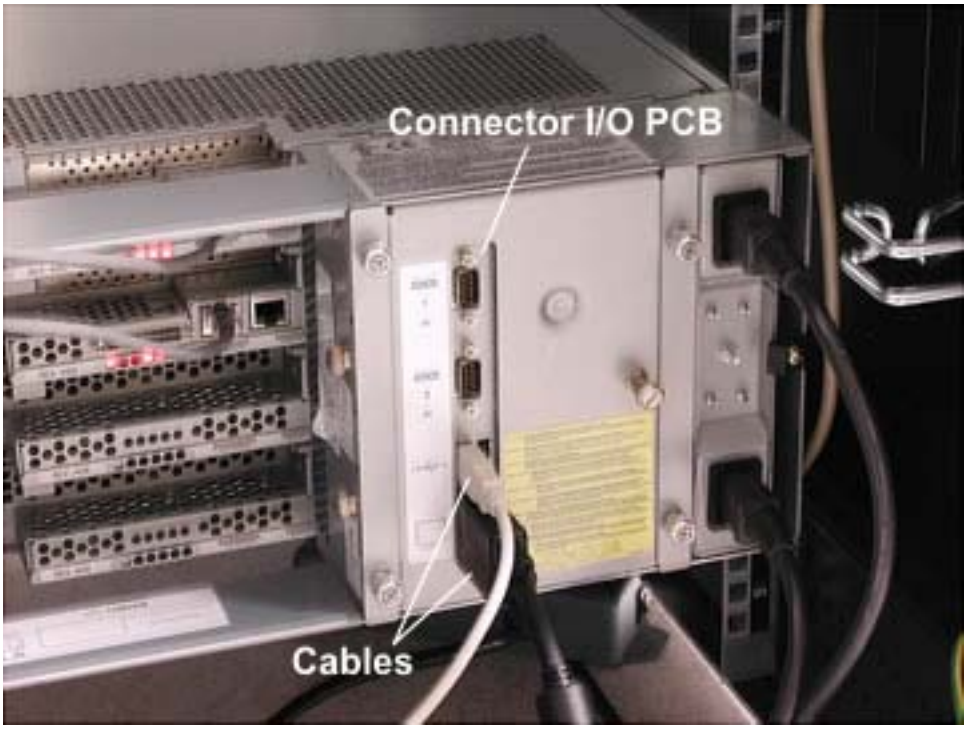


5. Pull the clock card straight out of the backplane, using the tab.

3.4.13 Connector I/O Board

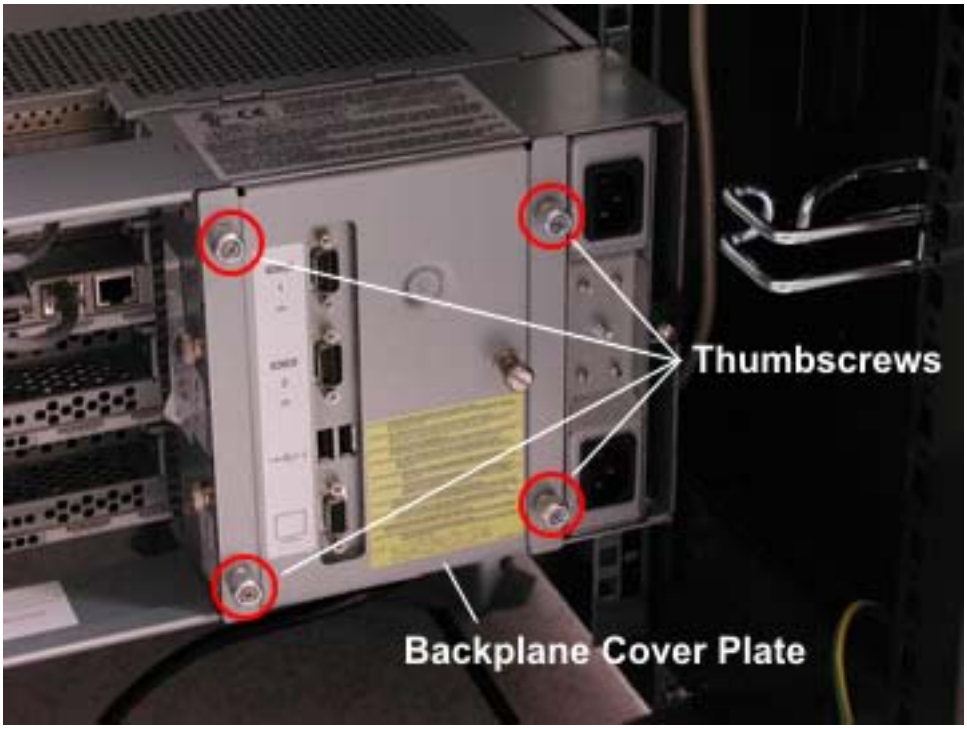
1. At the rear of the cabinet, remove the cables connected to the connector I/O board.

Figure 3-30. Connector I/O Board Cable Connections



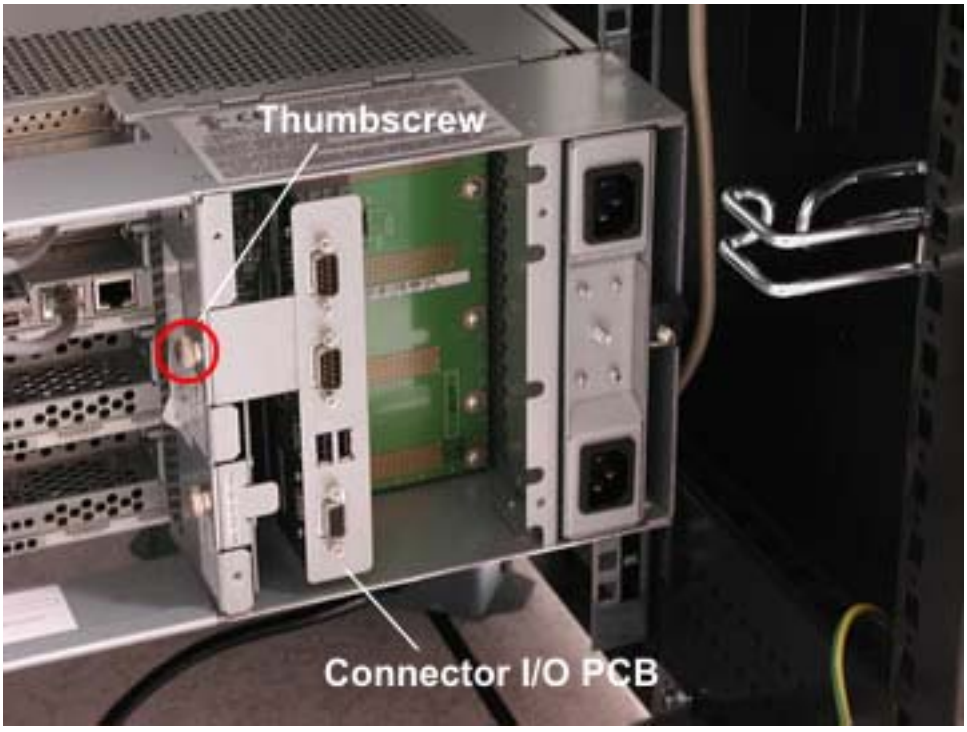
2. Unscrew the four thumbscrews on the backplane cover plate and remove the cover plate.

Figure 3-31. Backplane Cover Plate Screws



3. Unscrew the thumbscrew on the upper left side of the backplane. This screw secures the connector I/O board in place.

Figure 3-32. Connector I/O Board Screw



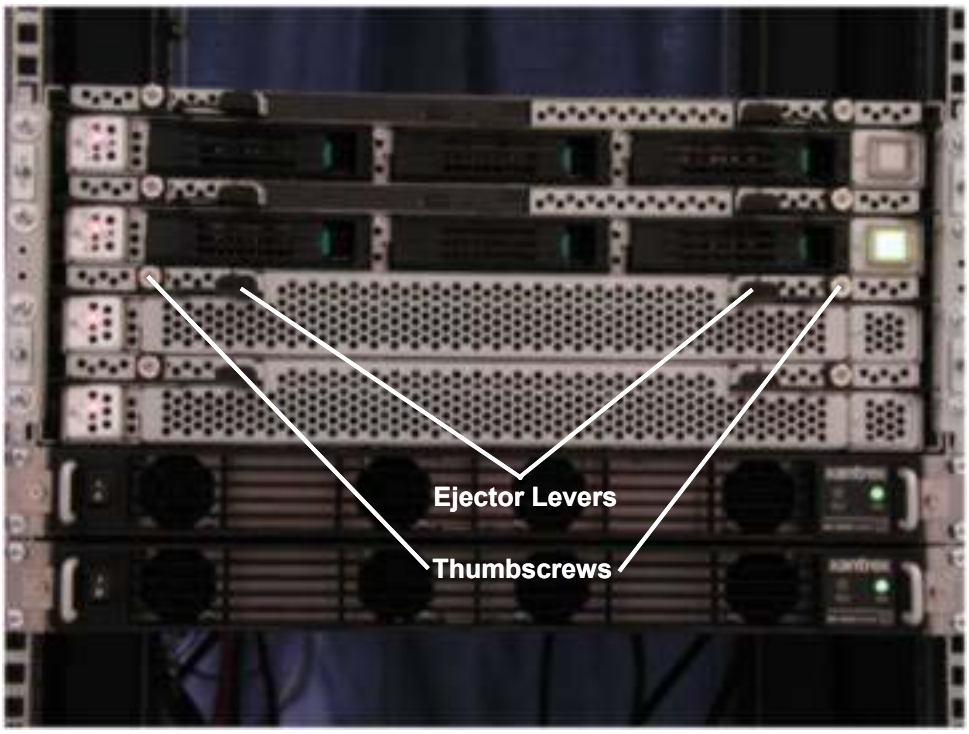
4. Pull the I/O connector board straight out of the backplane, using the tab.

3.4.14 4U Backplane Assembly

To remove the backplane, you must shut down the system and disconnect it from power.

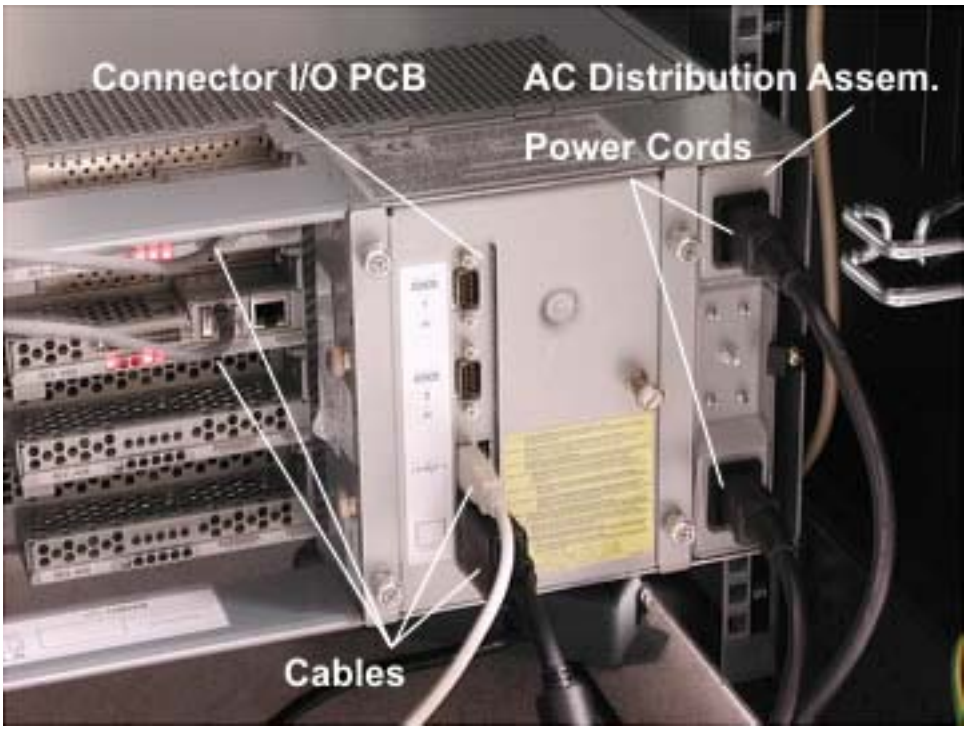
1. Shut down the ftServer system as described in Section 3.3.
2. At the front of the cabinet, loosen the two thumbscrews on the front of each CPU and I/O enclosure and open the ejector levers to disengage all the enclosures from the backplane.

Figure 3-33. CPU Enclosure Thumbscrews and Ejector Levers



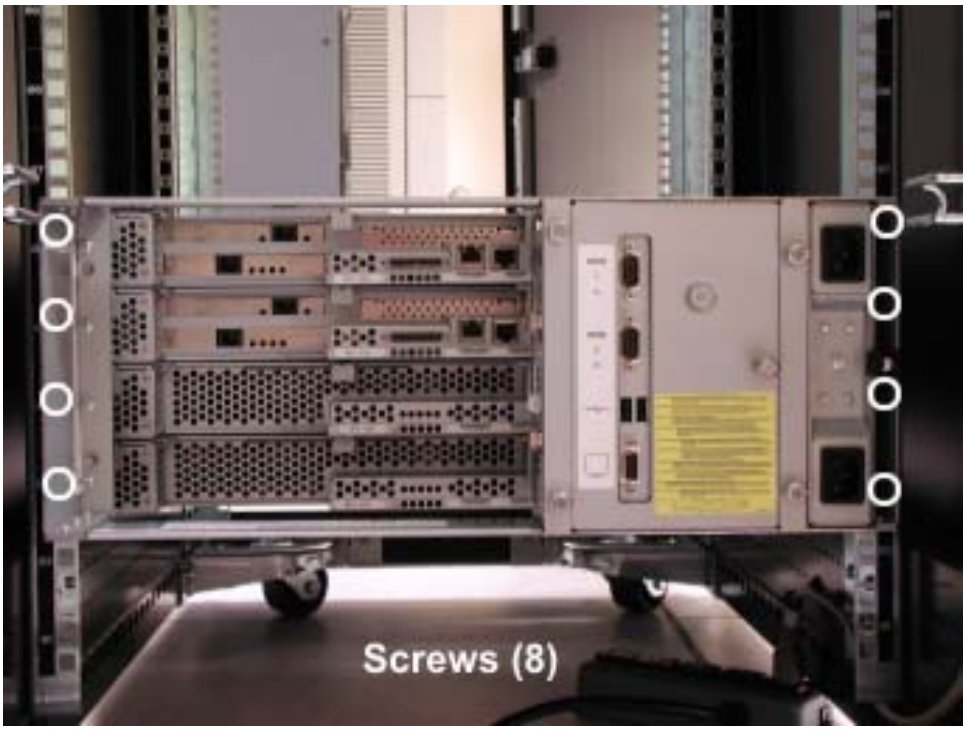
3. At the rear of the cabinet, disconnect the power cords from the AC distribution assembly and all the cables connected to the connector I/O board and the PCI adapters.

Figure 3-34. Power Cord and Cable Connections at Rear of Cabinet.



4. Remove the eight screws (four on each side) that secure the backplane assembly to the rails.

Figure 3-35. Backplane Assembly Screws



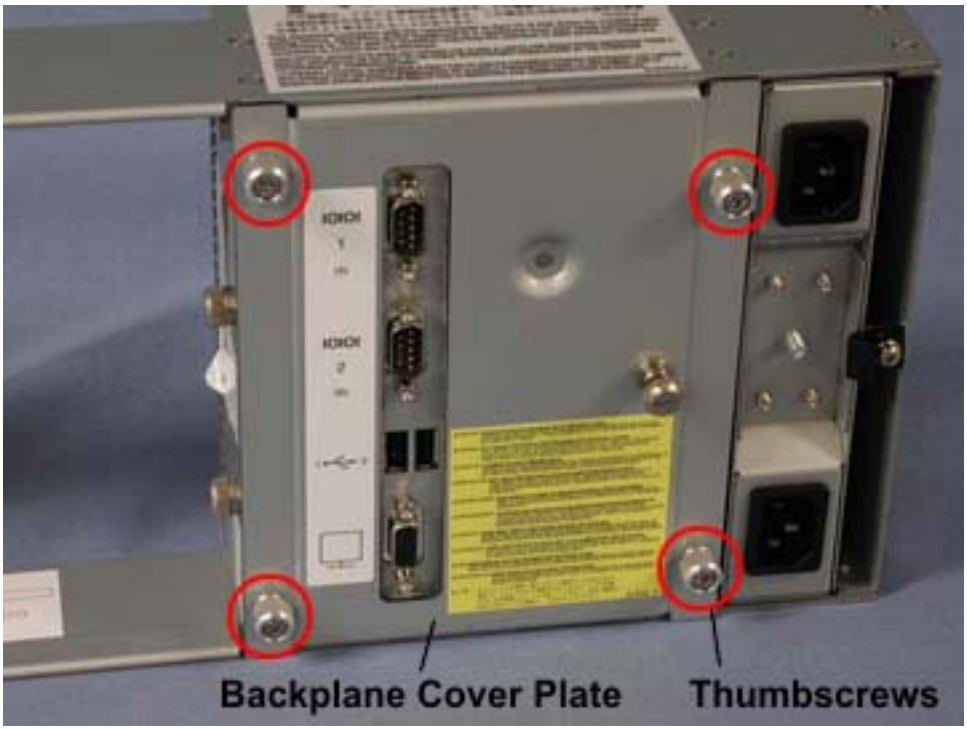
5. Pull the backplane assembly straight out of the rails and set it on a stable surface.

3.4.15 Backplane Board

To remove the backplane board, you must shut down the system and disconnect it from power.

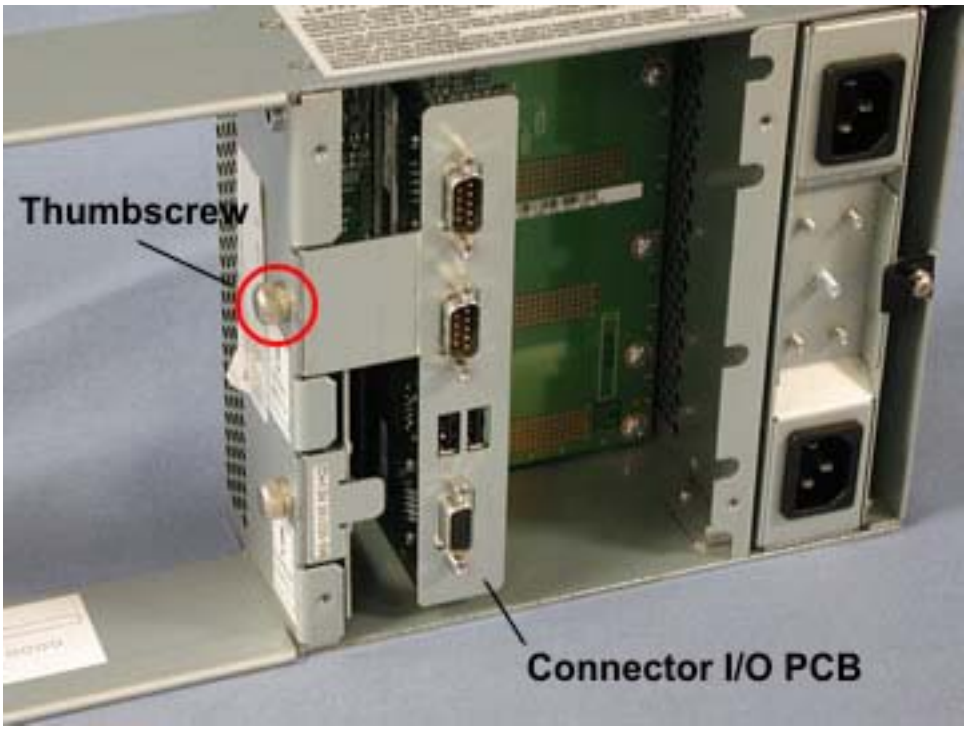
1. Shut down the ftServer system as described in Section 3.3.
2. Remove the backplane assembly as described in Section 3.4.14.
3. Unscrew the four thumbscrews and remove the backplane cover plate.

Figure 3-36. Backplane Cover Plate Thumbscrews



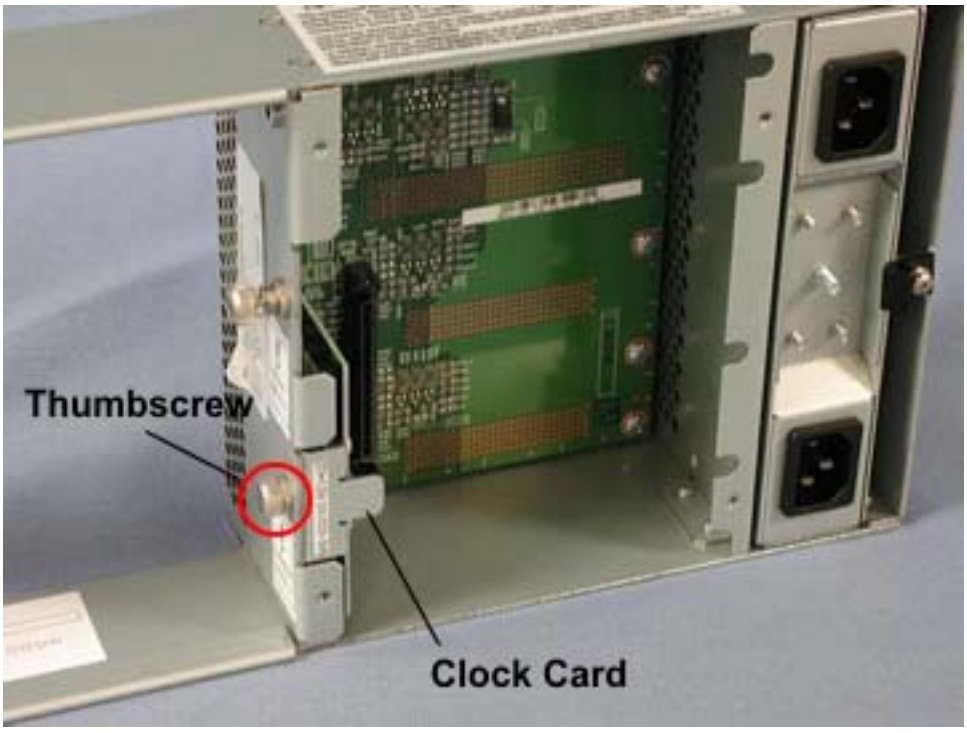
4. Unscrew the thumbscrew on the upper left of the backplane assembly. This screw secures the I/O connector board.

Figure 3-37. I/O Connector Board Screw



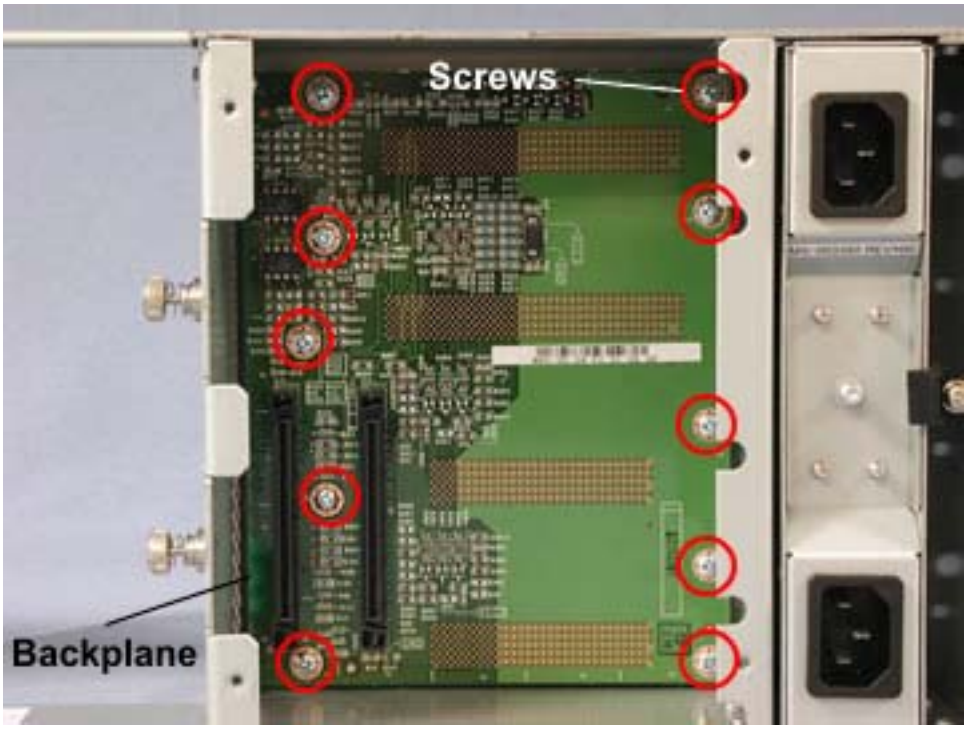
5. Unscrew the thumbscrew securing the clock card on the lower left of the backplane.

Figure 3-38. Clock Card Screw



6. Pull the clock card straight out of the backplane, using the tab.
7. Remove the 10 screws that secure the backplane board to the inside of the backplane assembly.

Figure 3-39. Backplane Board Screws

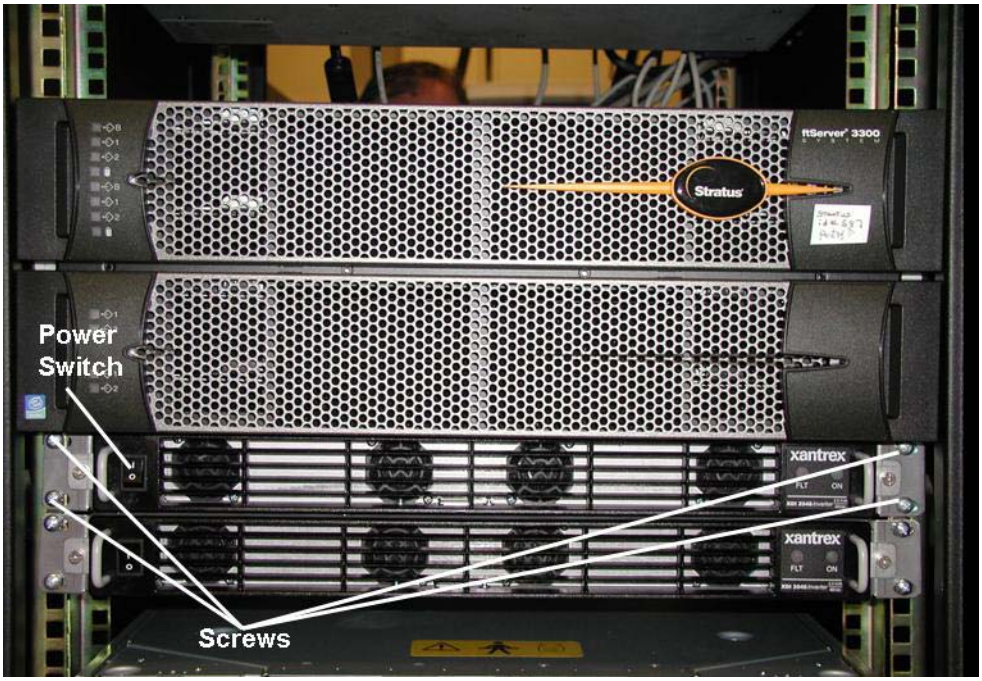


8. Lift the board out of the backplane assembly.

3.4.16 DC/AC Inverter

1. Shut down the system.
2. Turn off the power switch at the front of the DC/AC inverter.
3. Remove the four screws securing the inverter to the front vertical rails.

Figure 3-40. DC/AC Inverter Power Switch and Screws



4. Carefully pull the inverter out until it disconnects from its backplane, then slide it out of the cabinet.

4. FRU/DRU Hardware Removal/Replacement Procedures

This section lists the Field Replaceable Units (FRUs) and Distributor Replaceable Units (DRUs) in the ftServer T30 systems and describes the removal and replacement procedures for each one.

In most instances, FRUs and DRUs are duplexed and may be removed and replaced without total removal of power, and thus, without loss of continuous processing. However, in some instances, the system must be shut down and both main power switches turned off prior to removal and replacement of the FRU or DRU.

4.1 List of FRUs and DRUs

The following table lists the FRUs and DRUs in the ftServer T30 system.

Description	FRU/DRU	Part Number
CPU Enclosure 2.4-GHZ Processor and Heatsink Kit	**DRU**	**AK-000514**
CPU Enclosure Motherboard	**DRU**	**AA-G93130**
CPU Enclosure Power Connector Board	**DRU**	**AA-E72100**
CPU Enclosure Fan Assembly	**FRU**	**MF-000045**
CPU Enclosure LED Cable	**DRU**	**AW-001102**
CPU Enclosure Power Jumper	**FRU**	**AW-001106**
Core I/O Enclosure Power Supply	**FRU**	**AA-P70100**
Core I/O PCI Riser Board	**DRU**	**AA-E70400**
Core I/O Board	**DRU**	**AA-E70000**
CD-ROM Interface Board	**DRU**	**AA-E71500**
SCSI Backplane Assembly	**DRU**	**AA-E70500**
Core I/O Enclosure Power Switch Assembly	**DRU**	**AS-000389**
Core I/O Enclosure Ground Cable (14 AWG)	**DRU**	**AW-001117**
Core I/O Enclosure Internal Power Jumper Cable	**DRU**	**AW-001107**
Core I/O Enclosure IDE Cable	**DRU**	**AW-001124**

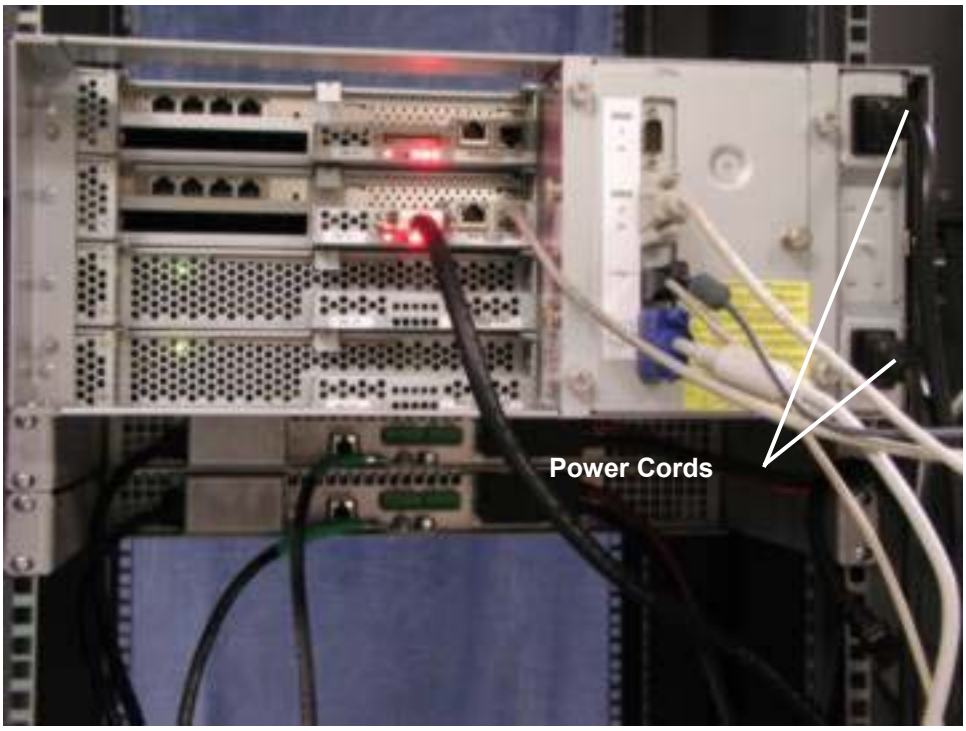
Core I/O Enclosure Power Switch with LED and Guard	**DRU**	**AW-001123**
Core I/O Enclosure LED Cable	**DRU**	**AW-001102**
Core I/O Enclosure Ultra 160 SCSI Jumper 68P	**DRU**	**AW-001104**
AC Distribution Assembly	**FRU**	**AS-E63010**

4.2 Power Removal

If total power removal is required, the system must be shut down prior to removing power and rebooted after the replacement unit is installed.

1. Shutdown the ft Linux operating system.
2. Turn off power to the DC/AC inverters.
3. Disconnect the DC power cords from the source.
4. Turn off power to the monitor and any peripheral devices.
5. At the back of the system, disconnect the two AC power cords.

Figure 4-1. AC Power Cords



4.3 Handling ESD Sensitive Parts

Clock cards and PCI adapters are particularly sensitive to damage from electrostatic discharge (ESD) because the electronic components are exposed when the device is not fully installed.

Caution: To avoid damaging these parts during handling, always take the following precautions.

- Always store cards and adapters in their static-protective envelope until you are ready to install them in the system.
- Always hold an adapter or card by its edges.
- Always ground yourself before handling a clock card or a PCI adapter, or before removing or replacing the I/O enclosure. Ground yourself by wearing a grounding strap.

4.4 Hardware Removal Procedures

This section contains the removal procedures for the FRUs and DRUs listed in the preceding table. Each of these procedures indicates any power removal requirements.

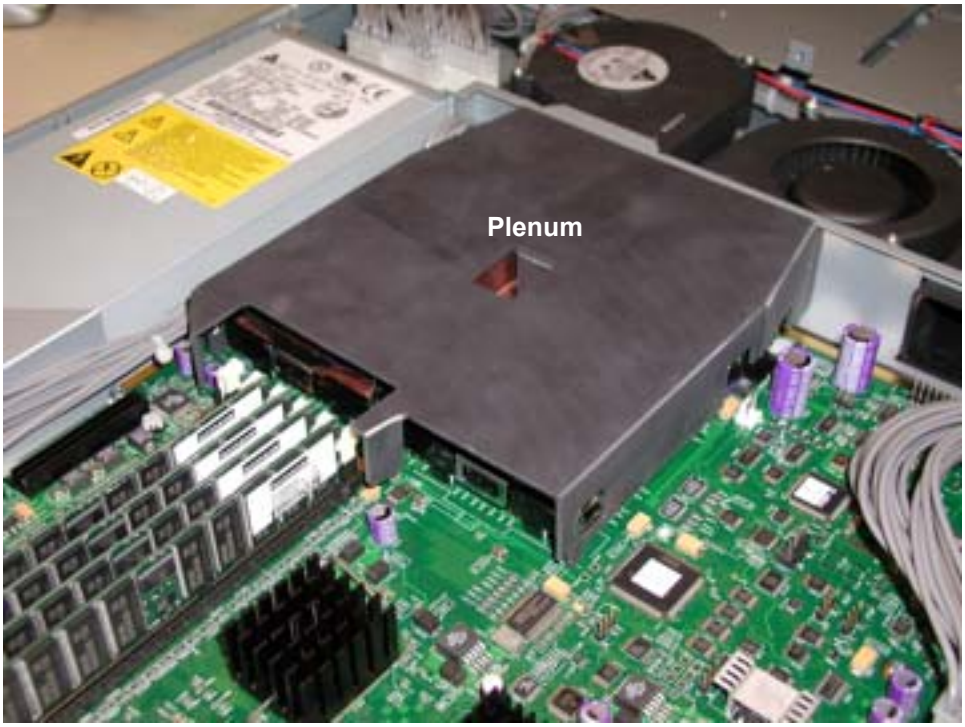
To perform the replacement procedure for each FRU or DRU, reverse the removable procedure. If any special replacement considerations are necessary, a replacement note is included.

4.4.1 CPU Enclosure Processor/Heat Sink

1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.

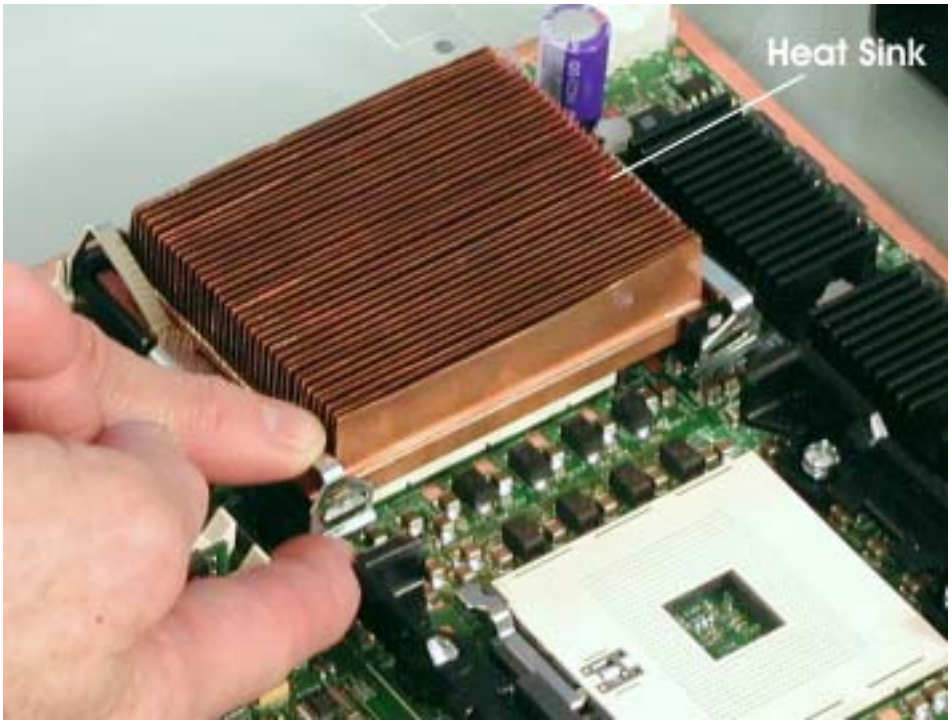
3. Remove the plastic plenum covering the processor heat sink.

Figure 4-2. Removing the Plastic Plenum



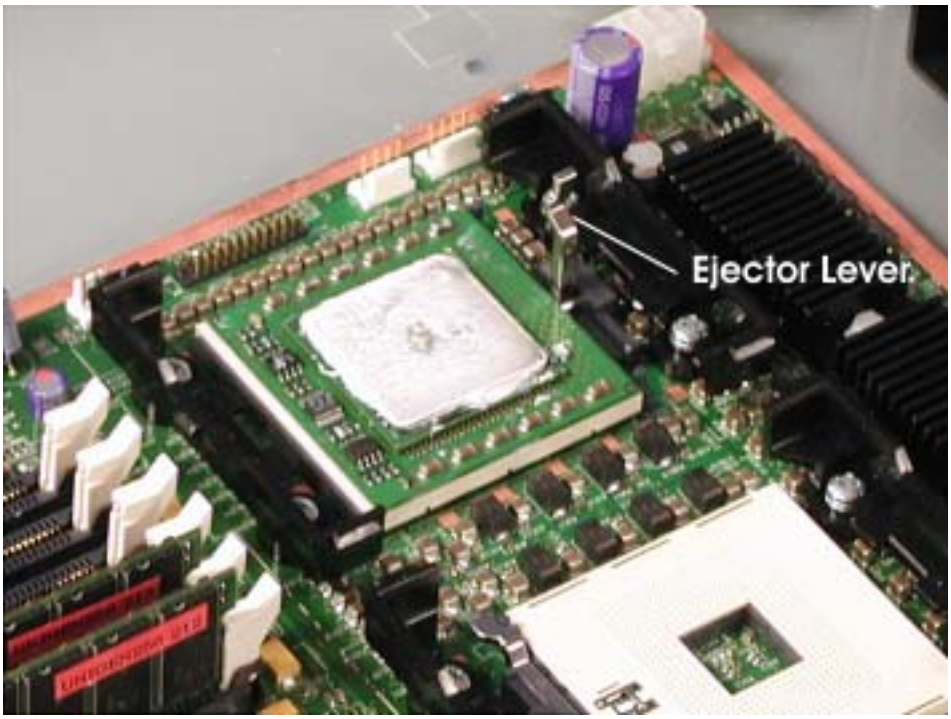
4. Push down on the heat sink clip with one hand and snap it off the bracket with the other. The heat sink must then be heated with a heat gun to allow it to be removed from the processor.

Figure 4-3. Removing Heat Sink



5. Release the processor's ejector levers and pull the processor straight up and out of the connector.

Figure 4-4. Processor Ejector Lever



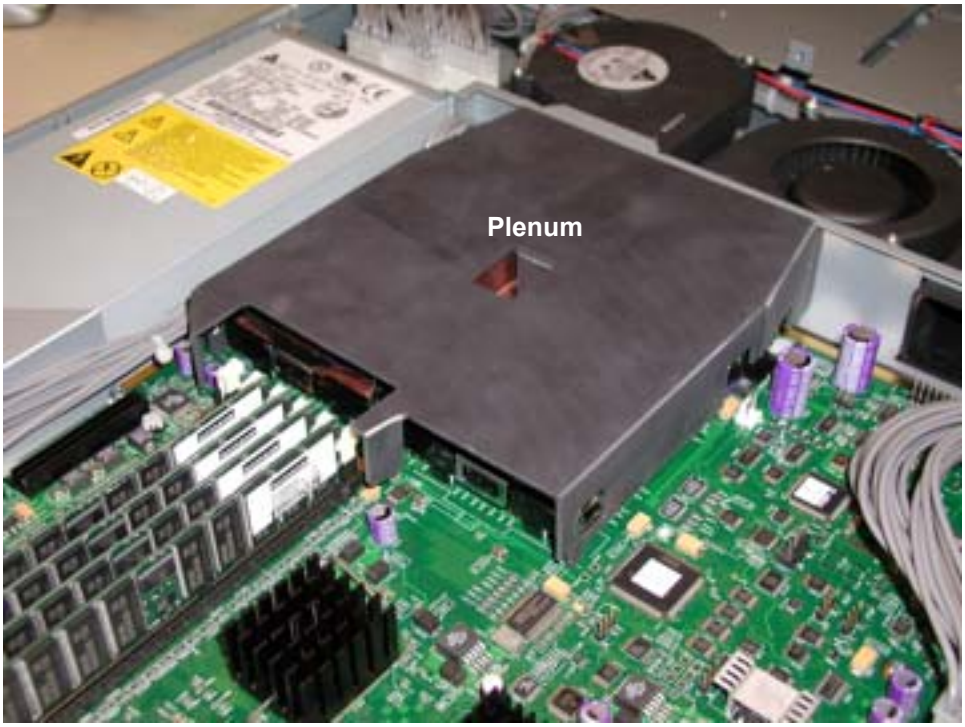
REPLACEMENT NOTE: Use the thermal grease included in the processor heat sink kit to install the new heat sink on the processor.

4.4.2 CPU Enclosure Motherboard

1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.

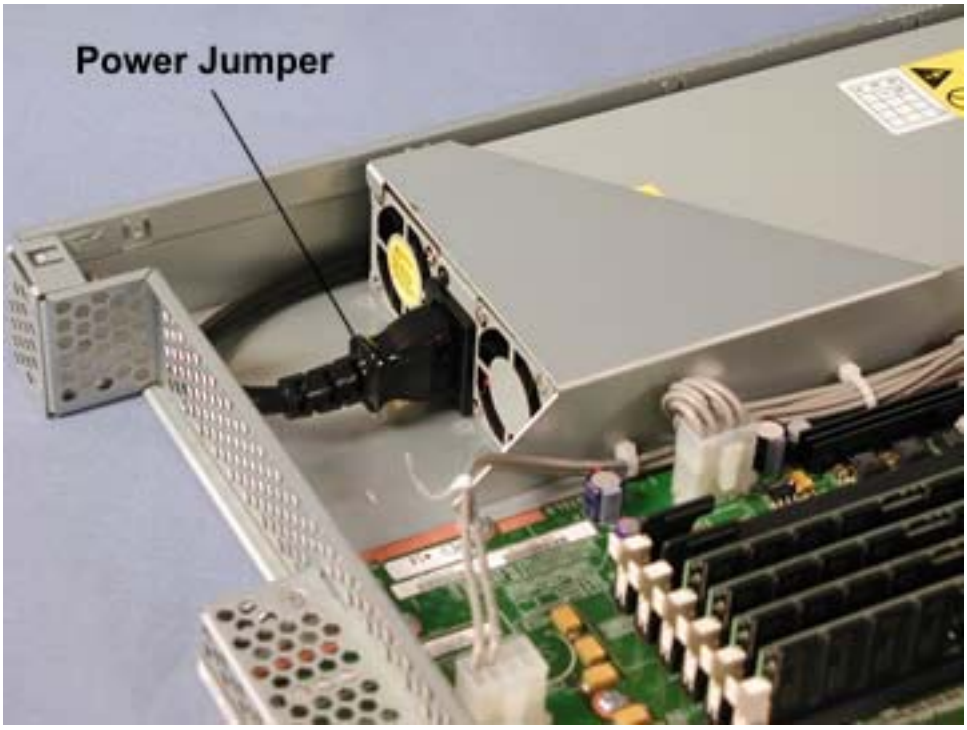
3. Remove the plastic plenum covering the processor heat sink.

Figure 4-5. Plenum



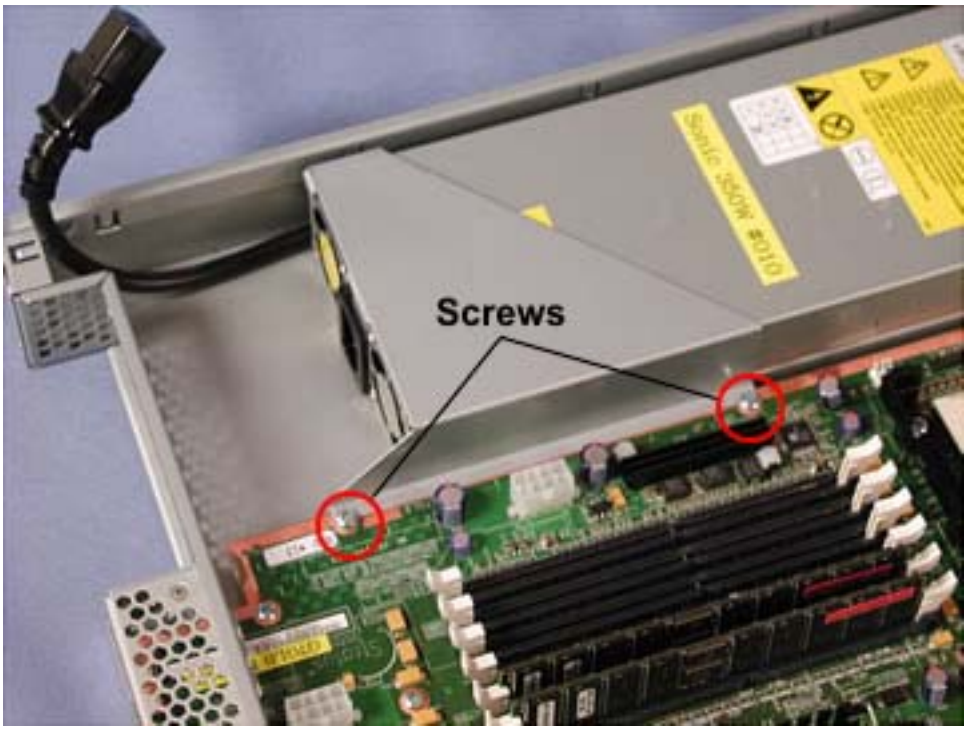
4. Disconnect the power jumper at the back of the power supply.

Figure 4-6. Power Jumper



5. Remove the two screws on the right side (from the back) of the metal bracket covering the power supply and lift the bracket off.

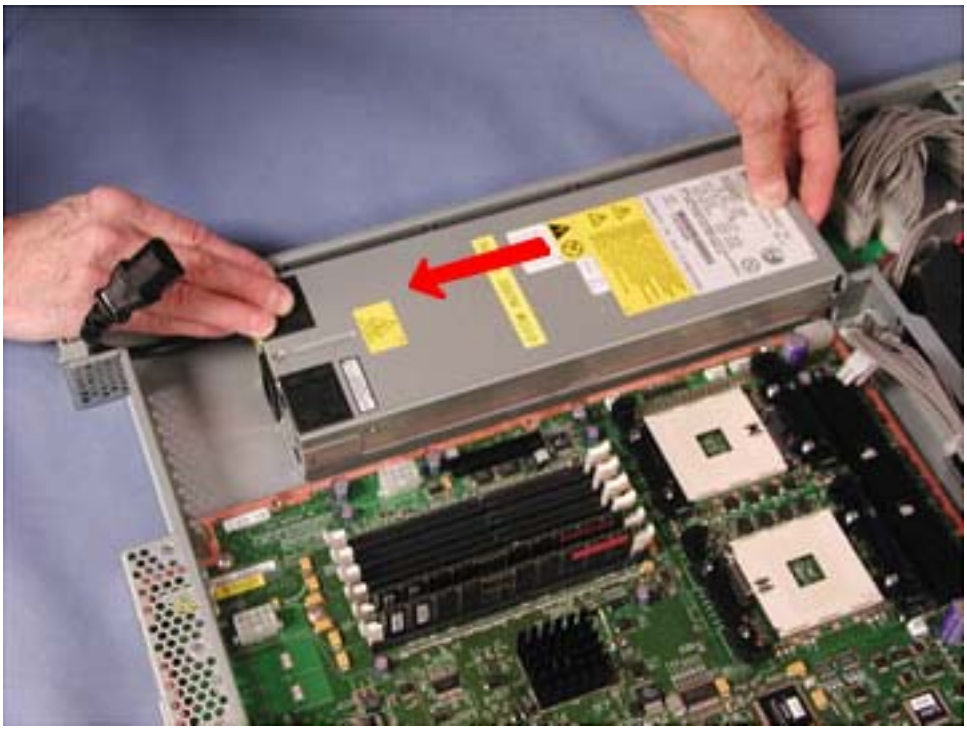
Figure 4-7. Power Supply Bracket Screws



C A U T I O N: The surface of the power supply may be hot.

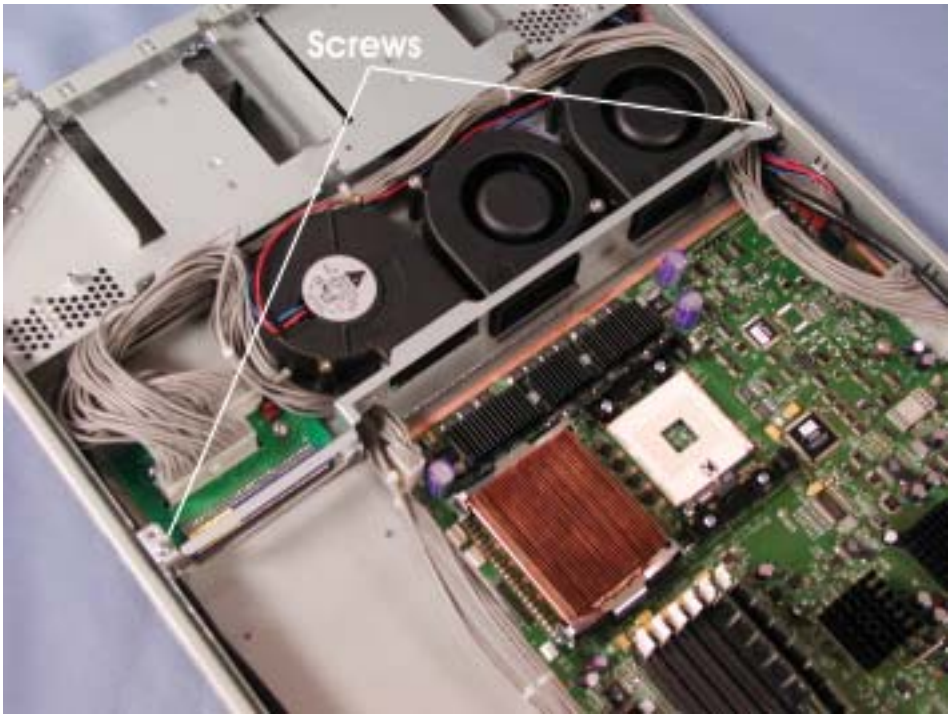
6. Place one hand at the front of the power supply and push on it while pulling it the **straight** back with the other hand until it disconnects from the front connector.

Figure 4-8. Removing Power Supply



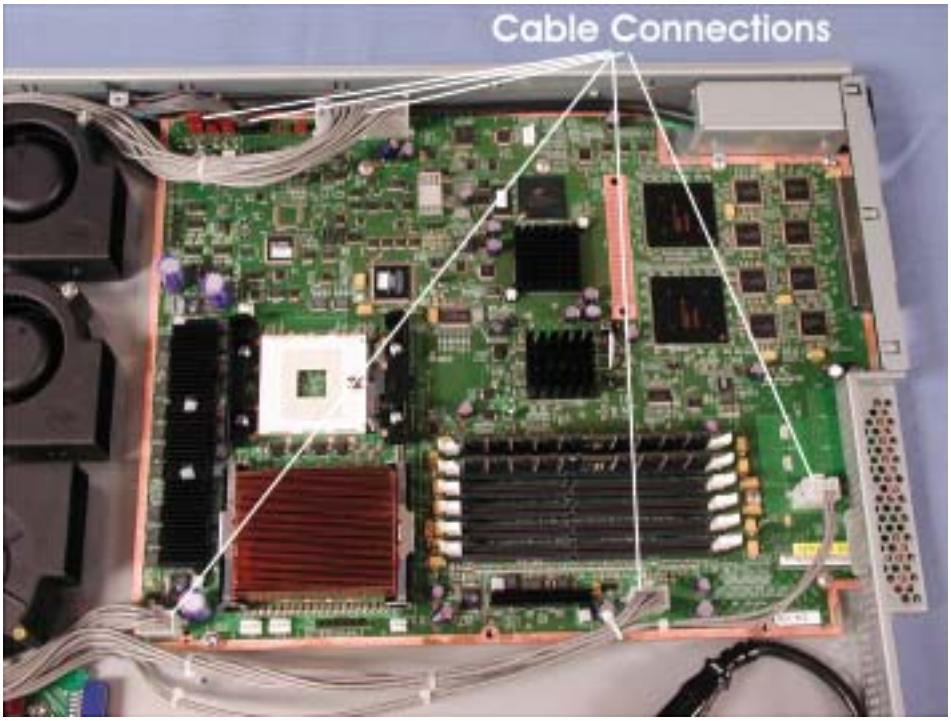
7. Remove the two screws securing the fan assembly bracket and lift it out of the enclosure.

Figure 4-9. Fan Assembly Bracket Screws



8. Disconnect all cables (eight total) from the motherboard.

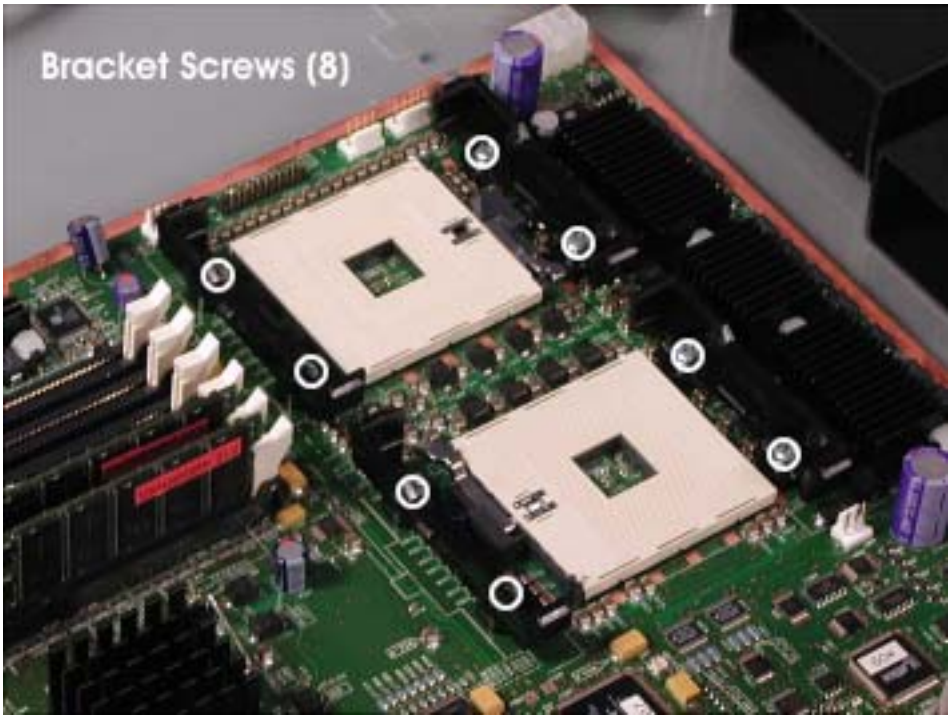
Figure 4-10. Motherboard Cable Connections



9. Remove each processor and its heat sink as described in Section 4.4.1.

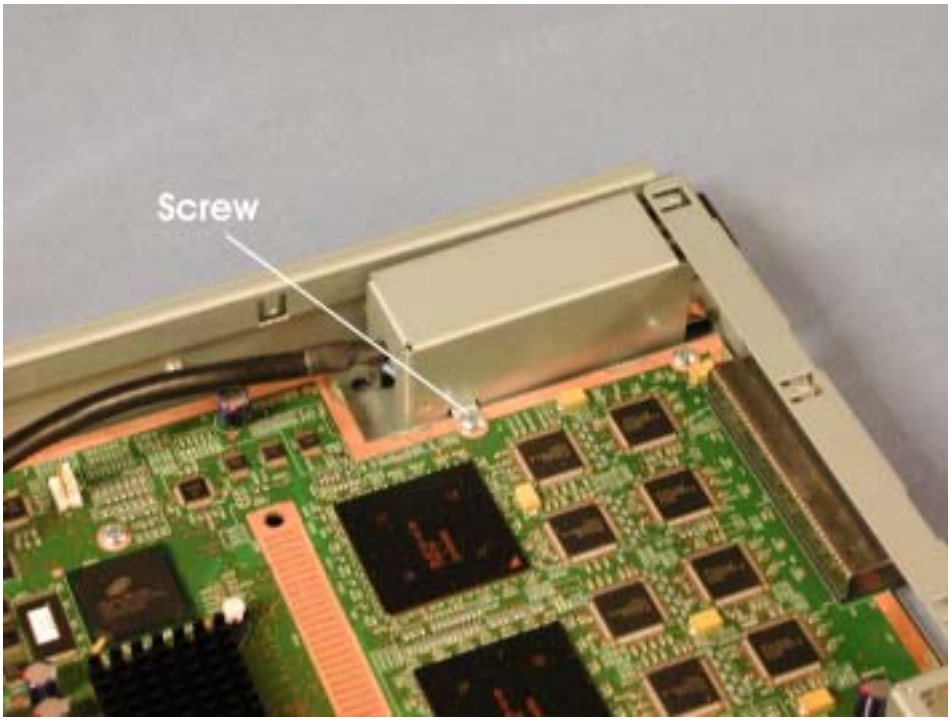
10. Remove the two screws securing each of the processor heat sink brackets (4 brackets total).

Figure 4-11. Processor Heat Sink Bracket Screws



11. Remove the screw securing the AC inlet cover and lift off the cover.

Figure 4-12. AC Inlet Cover Screw



12. Remove the remaining seven screws securing the motherboard.

Figure 4-13. Motherboard Screws

13. Carefully slide the motherboard toward the front and lift it out of the enclosure.

4.4.3 CPU Enclosure Power Connector Board

1. Remove the core CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.

3. Disconnect the two cables from the power connector board.

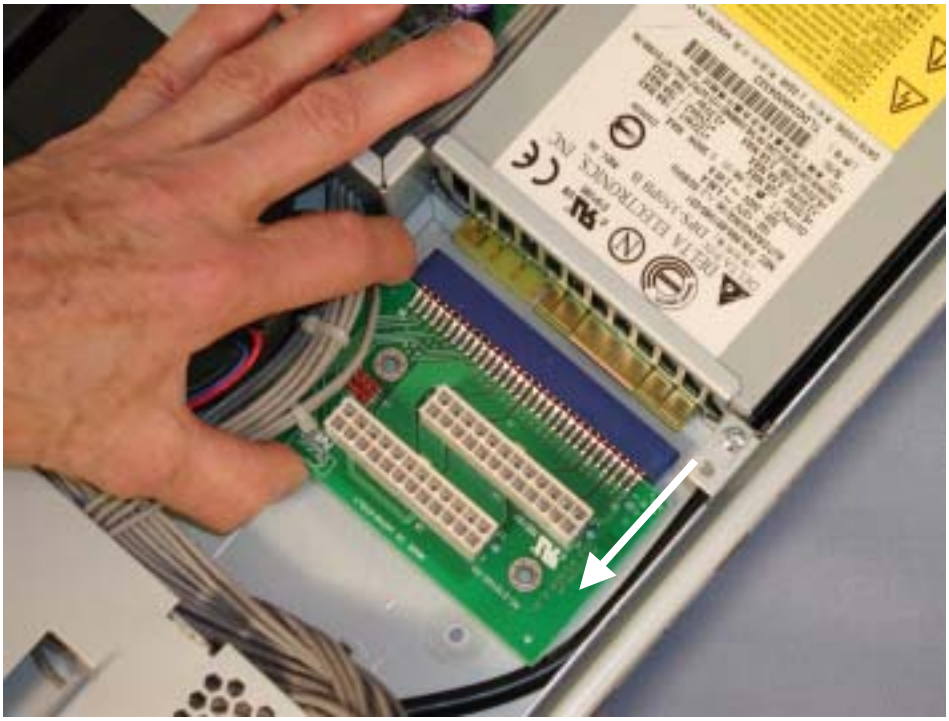
Figure 4-14. Power Connector Board Connectors

4. Remove the two screws securing the power connector board to the chassis.

Figure 4-15. Power Connector Board Screws

5. Pull the power connector board straight out horizontally from the power supply.

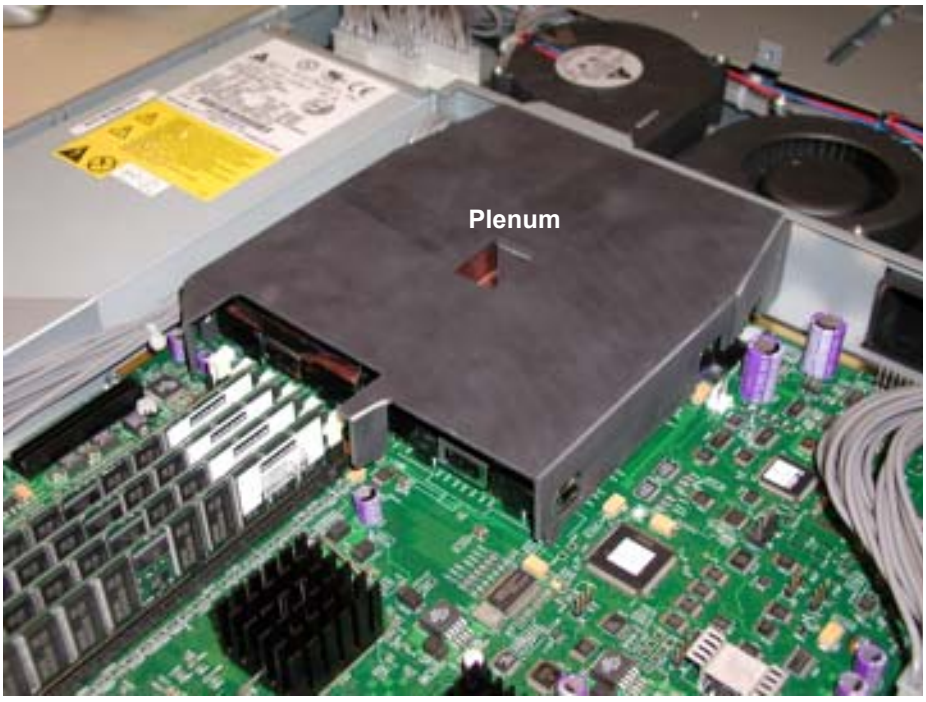
Figure 4-16. Removing the Power Connector Board



4.4.4 CPU Enclosure LED Cable

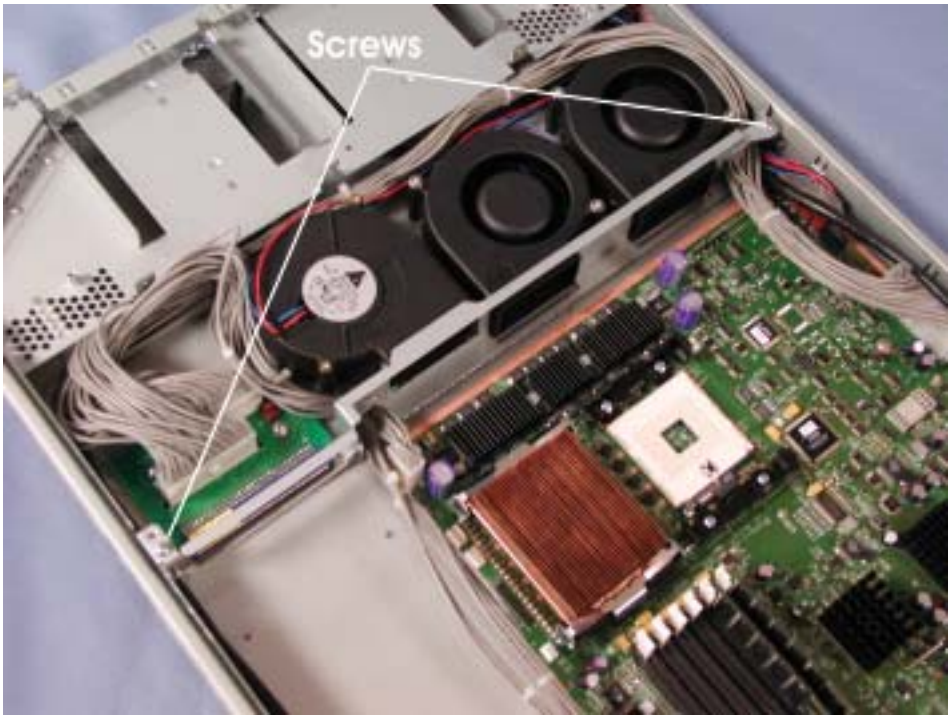
1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.
3. Remove the power supply as described in Section 3.4.4.
4. Remove the plastic plenum covering the processor heat sink.

Figure 4-17. Plenum



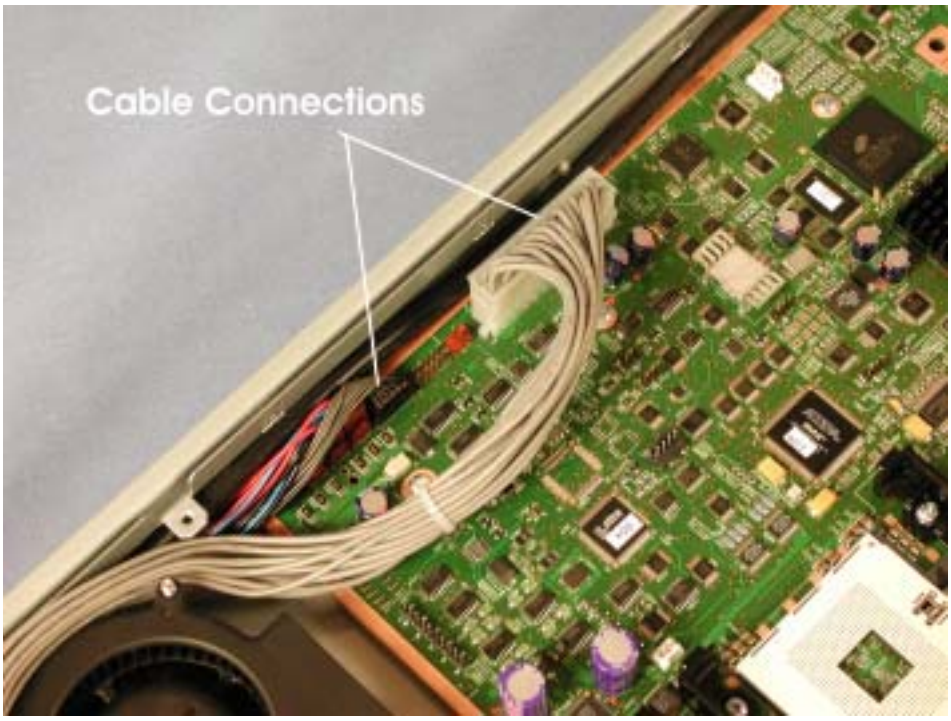
5. Remove the two screws securing the fan assembly bracket and lift it out of the enclosure.

Figure 4-18. Fan Assembly Bracket Screws



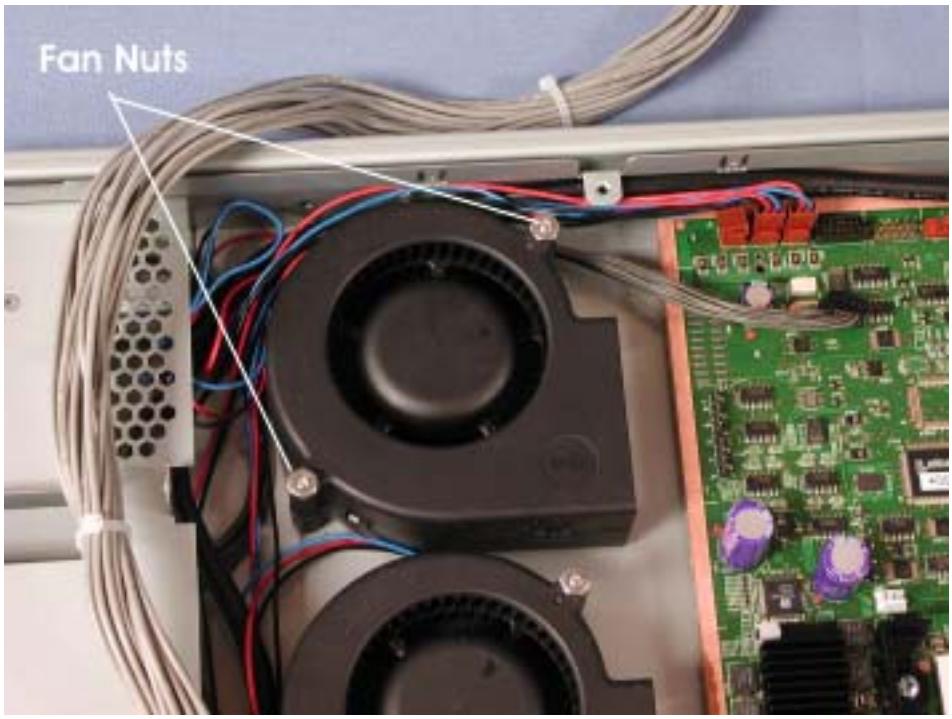
6. Disconnect the power cable and LED cable from the motherboard.

Figure 4-19. Power Cable and LED Cable Connectors at Motherboard



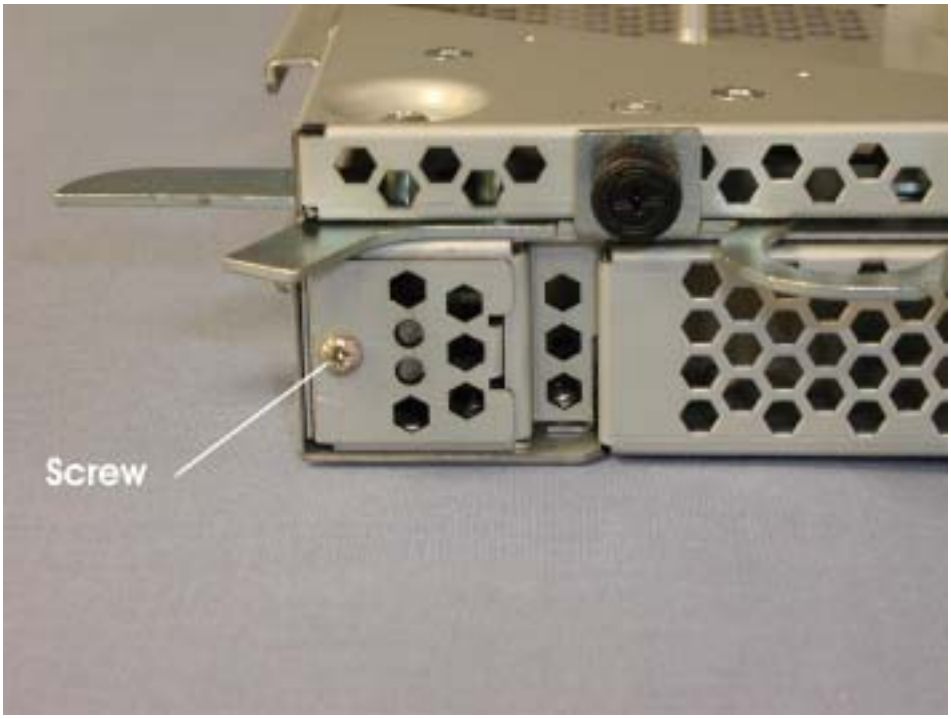
7. Remove the two 5/16“ nuts from the fan nearest the right side of the enclosure and lift up the fan.

Figure 4-20. Fan Nuts



8. Remove the screw in the CPU enclosure LED PCB at the front of the enclosure.

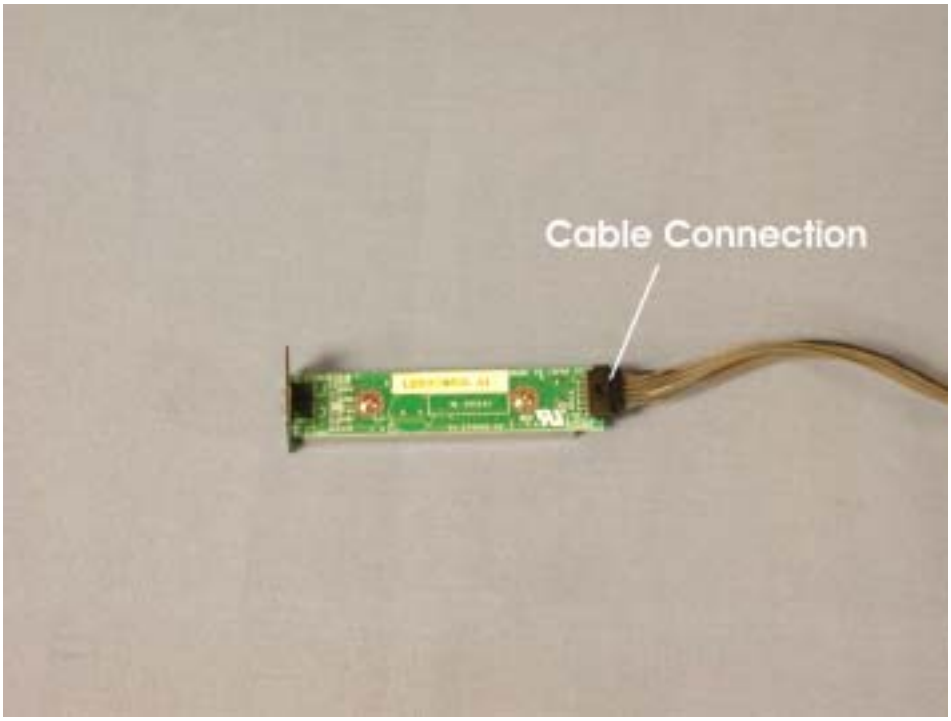
Figure 4-21. CPU Enclosure LED PCB Screw



9. Pull the CPU enclosure LED PCB and cable straight forward and all the way out of the front of the enclosure.

10. Disconnect the LED Cable from the back of the LED PCB.

Figure 4-22. CPU Enclosure LED PCB and Cable Connector

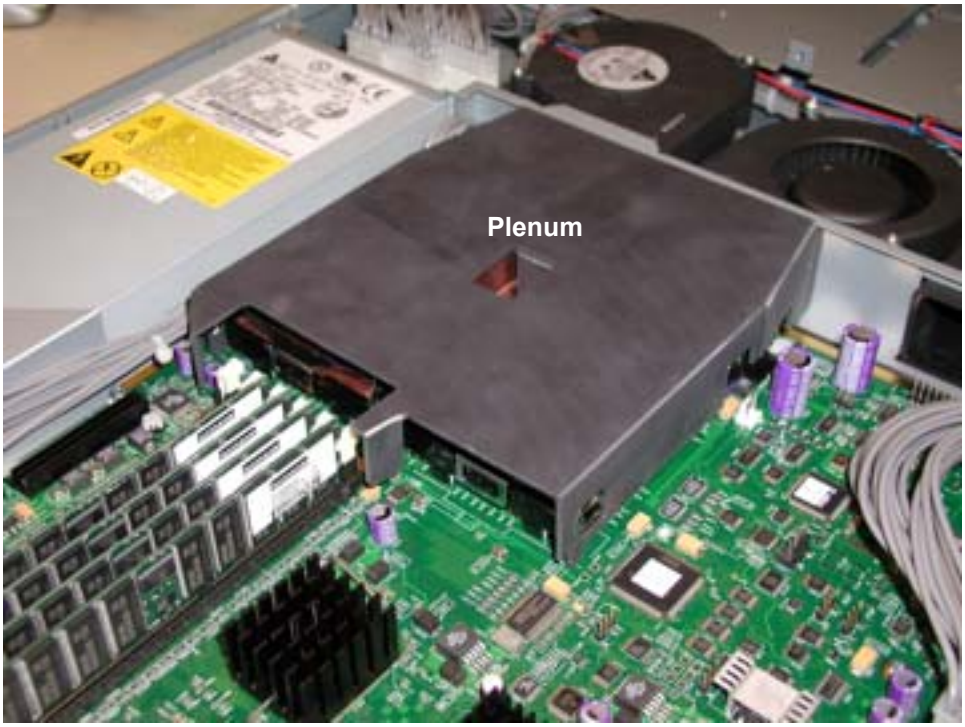


4.4.5 CPU Enclosure Power Jumper

1. Remove the CPU enclosure as described in Section 3.4.1.
2. Remove the CPU enclosure cover as described in Section 3.4.3.
3. Remove the power supply as described in Section 3.4.4.

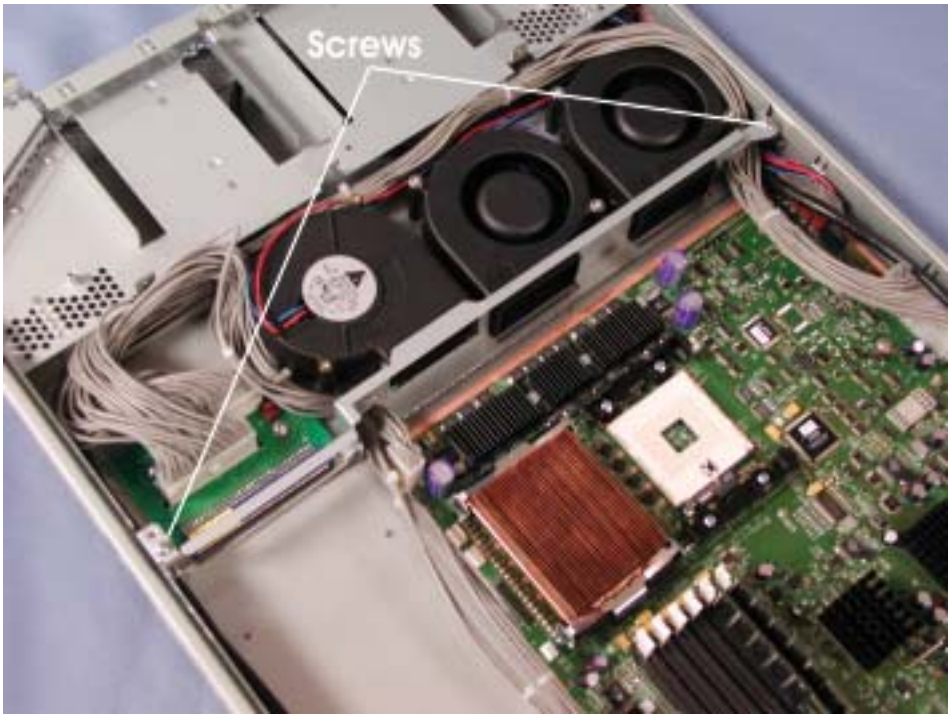
4. Remove the plastic plenum covering the processor heat sink.

Figure 4-23. Plastic Plenum



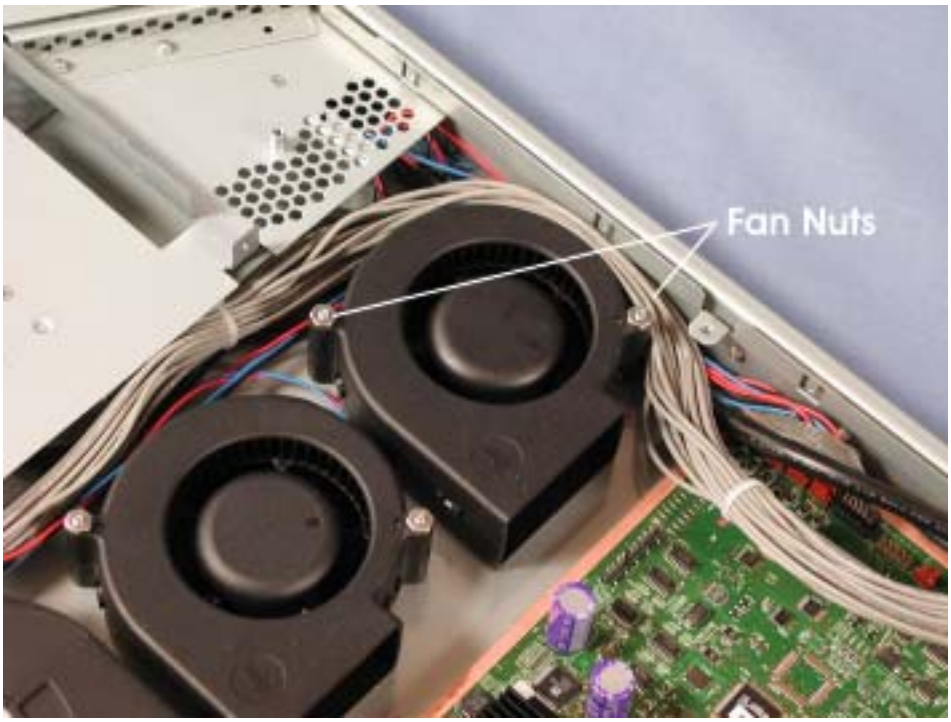
5. Remove the two screws securing the fan assembly bracket and lift it out of the enclosure.

Figure 4-24. Fan Assembly Bracket Screws



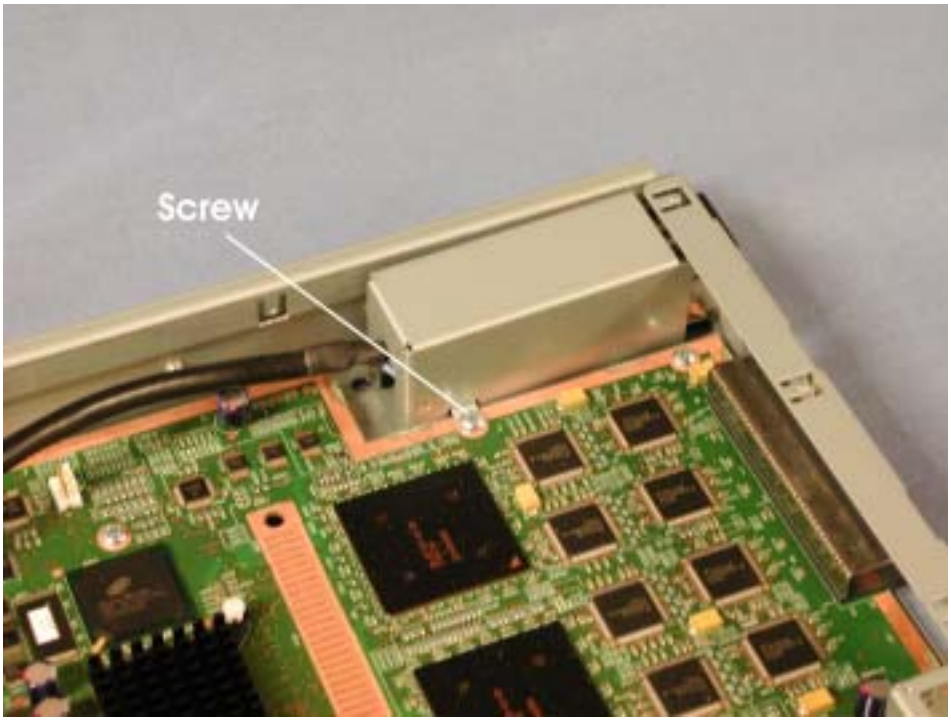
6. Remove the two 5/16“ nuts from the fan nearest the right side of the enclosure and lift up the fan.

Figure 4-25. Fan Nuts



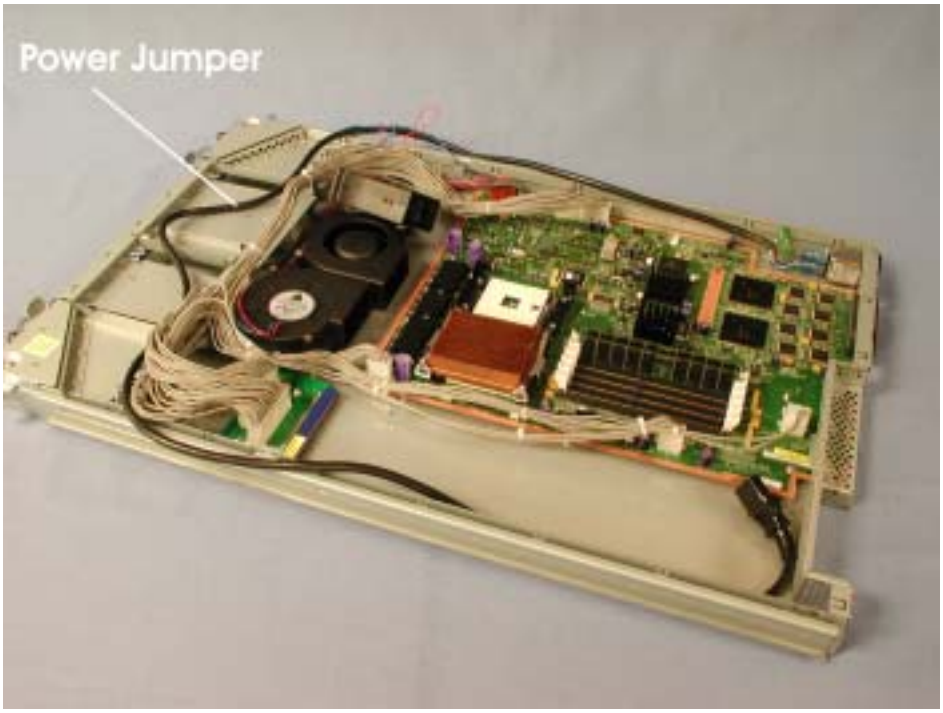
7. Remove the screw securing the AC inlet cover and lift off the cover.

Figure 4-26. AC Inlet Cover Screw



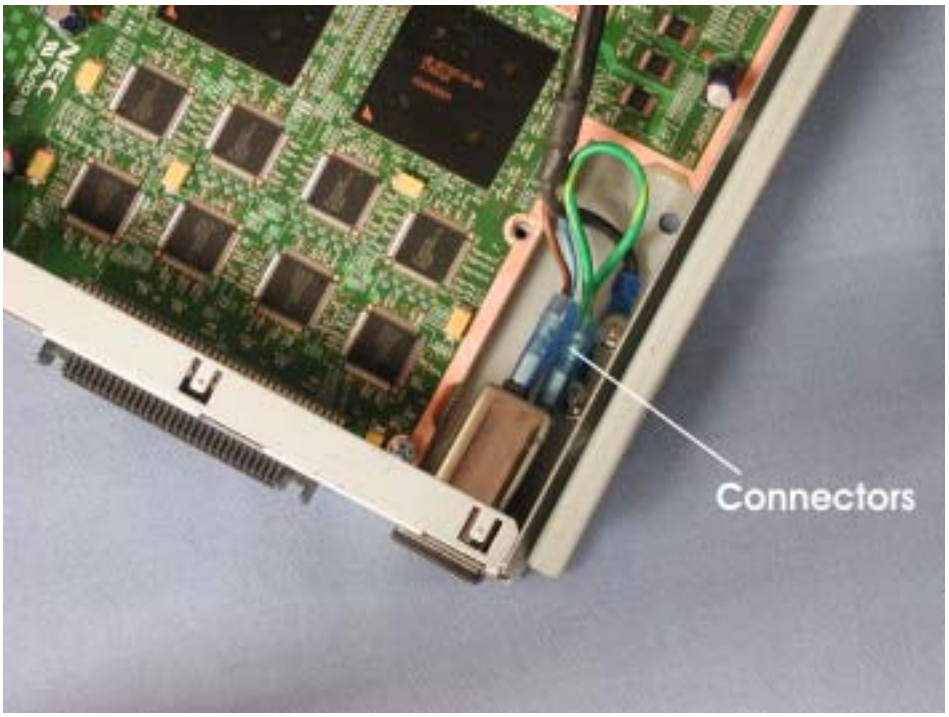
8. Pull the power jumper out from under the metal shield as shown.

Figure 4-27. Removing Power Jumper



9. At the rear of the enclosure, disconnect the power jumper from the AC inlet and the chassis (total of three connectors).

Figure 4-28. Power Jumper Connection at AC Inlet

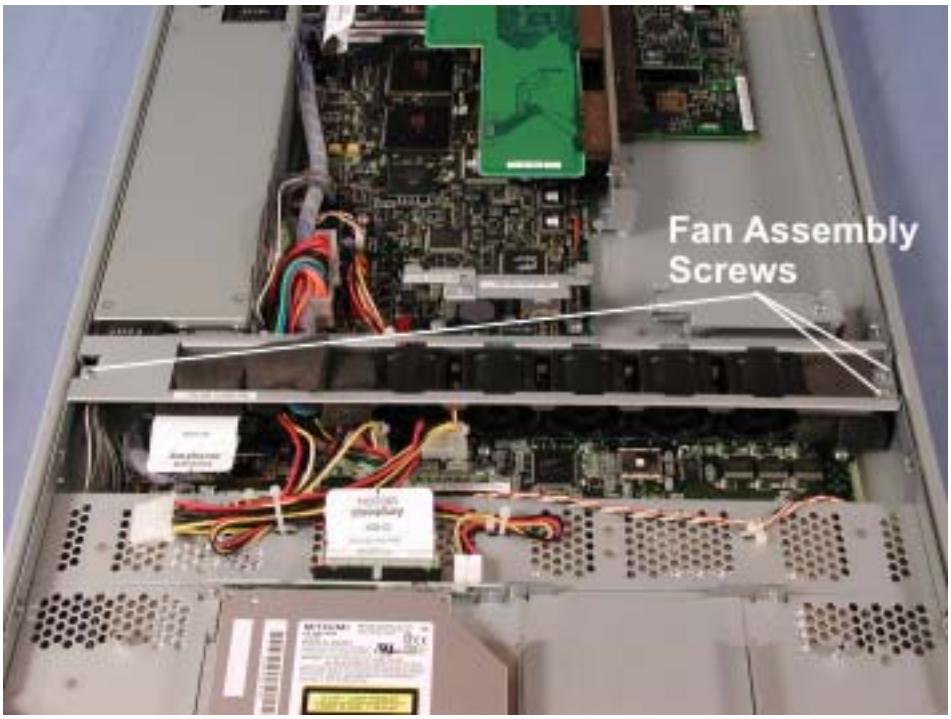


4.4.6 Core I/O Enclosure Power Supply

1. Remove the core I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.

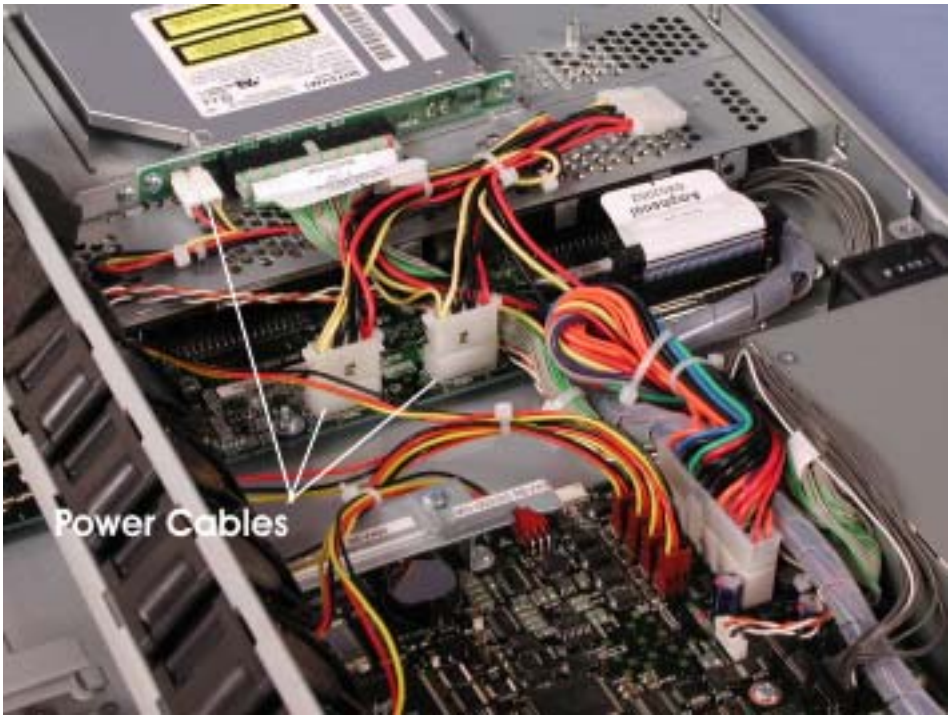
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-29. Fan Assembly Screws



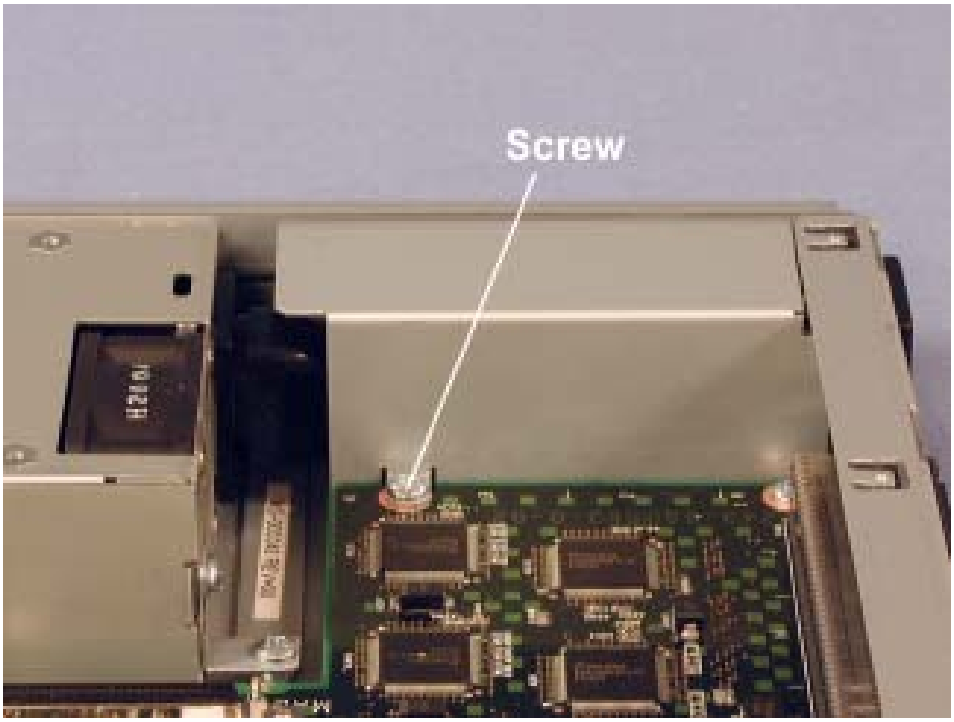
4. Disconnect the power cables from the SCSI backplane and the CD-ROM interface board.

Figure 4-30. Power Cables at SCSI Backplane and CD-ROM Interface Board



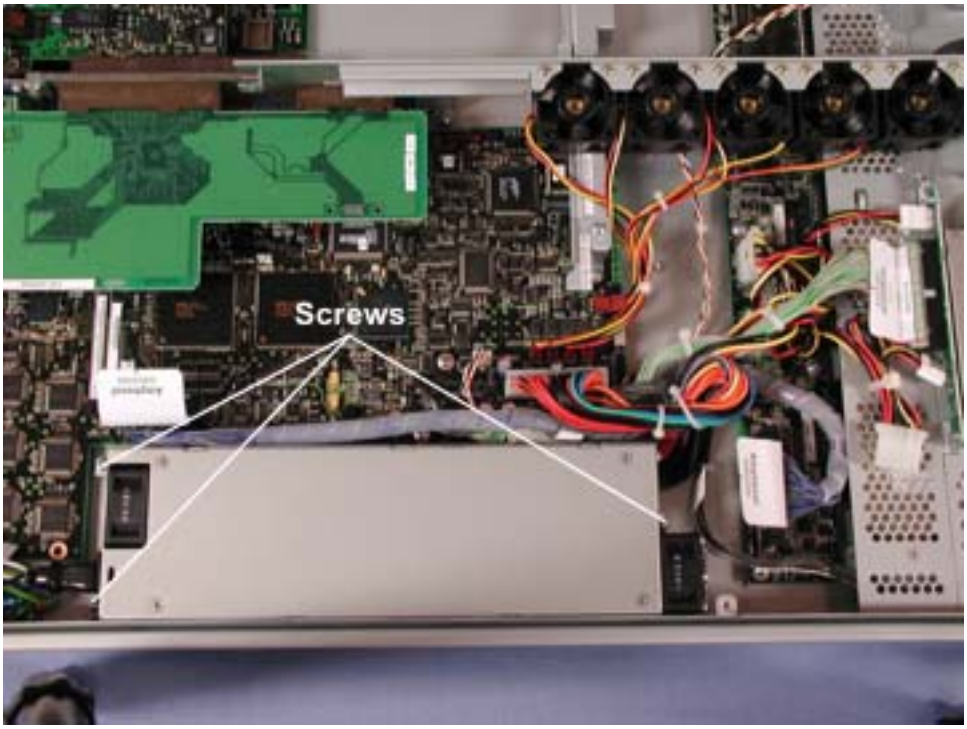
5. Remove the screw securing the AC inlet cover and lift the cover off.

Figure 4-31. AC Inlet Screw



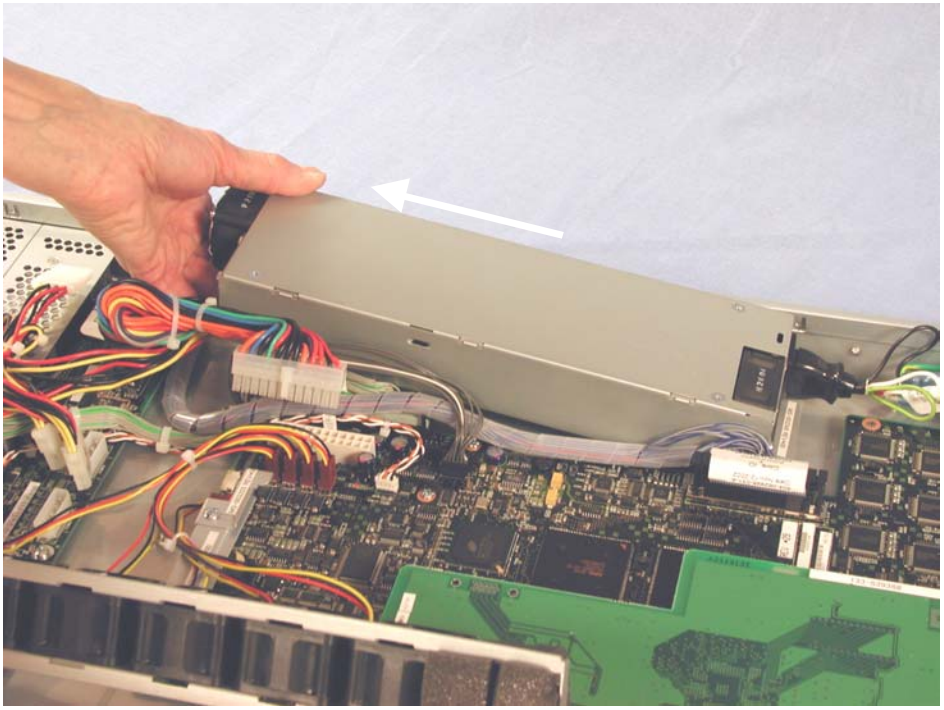
6. Remove the three screws securing the power supply.

Figure 4-32. Power Supply Screws



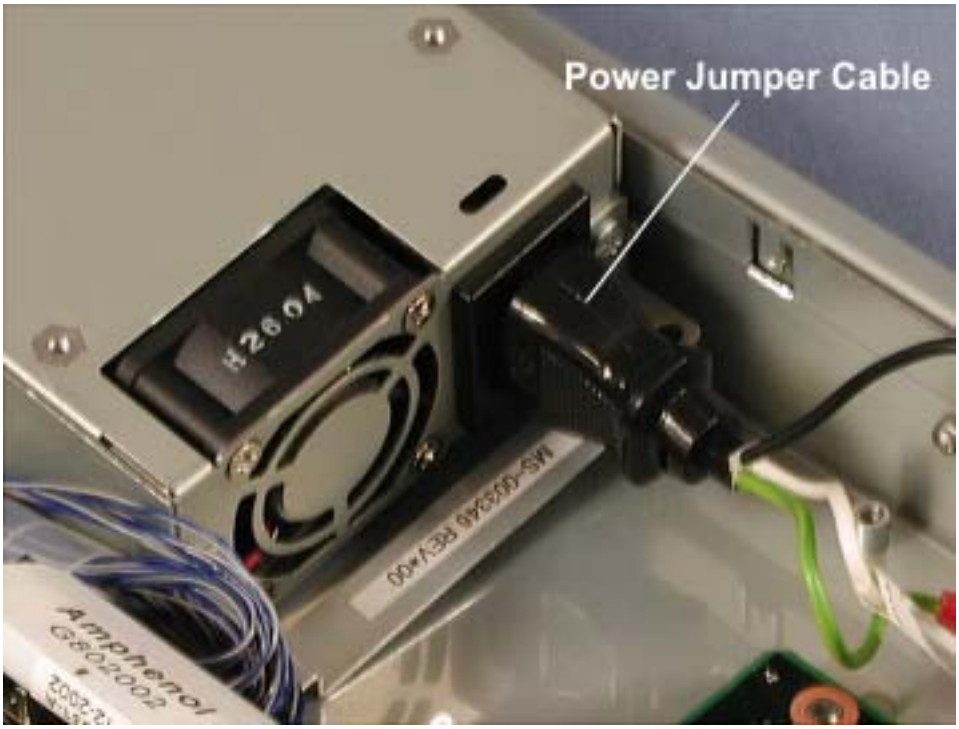
7. Lift the end of the power supply and slide it slightly forward.

Figure 4-33. Removing Power Supply



8. Disconnect the power jumper cable from the power supply.

Figure 4-34. Power Jumper Cable Connection

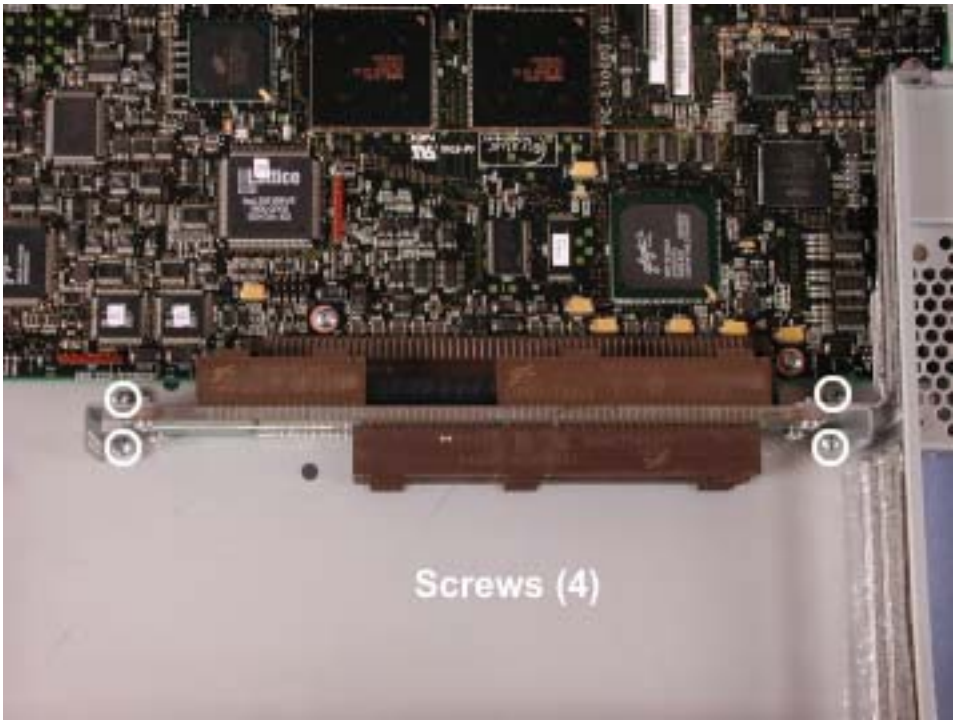


4.4.7 Core I/O Enclosure PCI Riser Board

1. Remove the core I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove all the PCI adapters as described in Section 3.4.8.

4. Remove the four screws securing the bracket holding the PCI riser board.

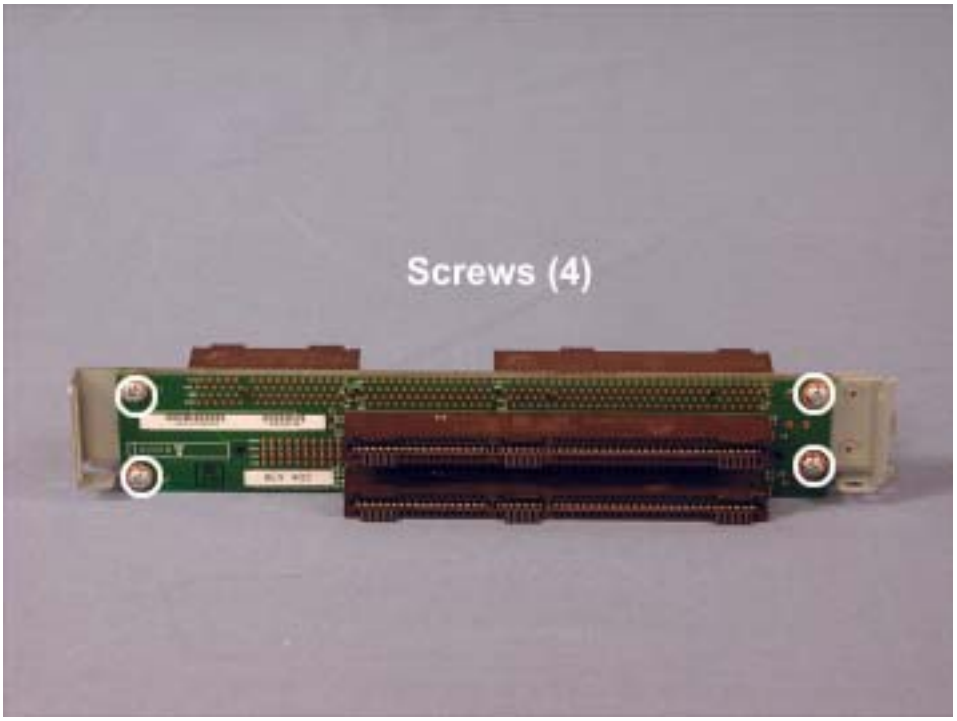
Figure 4-35. Bracket Screws



5. Pull the PCI riser bracket horizontally out of its connector.

6. Remove the four screws securing the PCI riser board to the bracket.

Figure 4-36. PCI Riser Board Screws

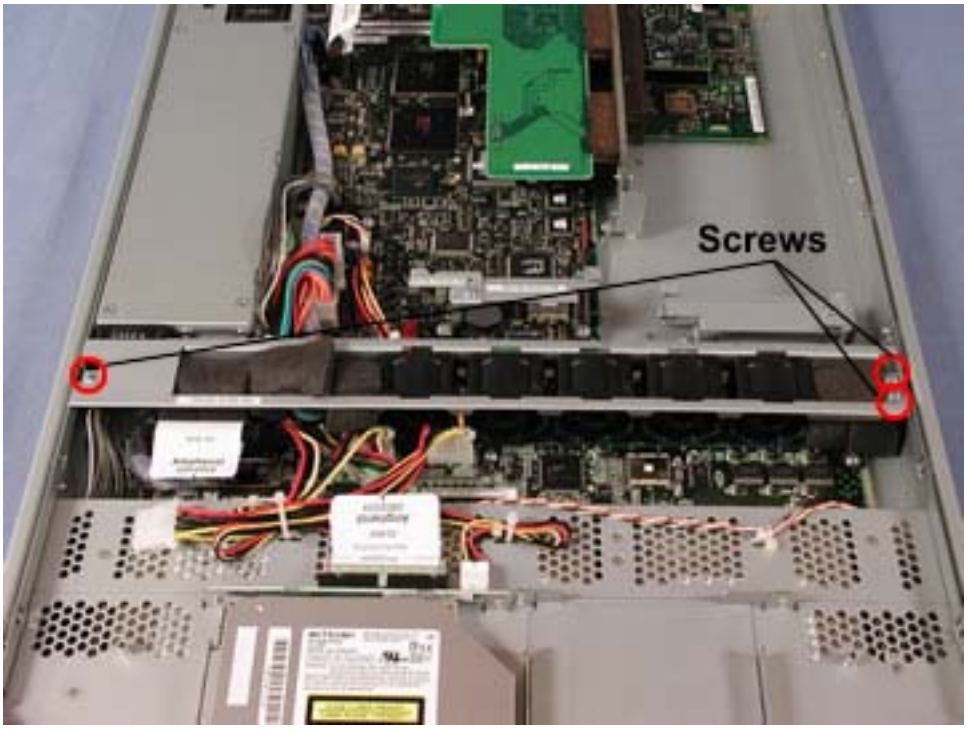


4.4.8 Core I/O Board

1. Remove the core I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.

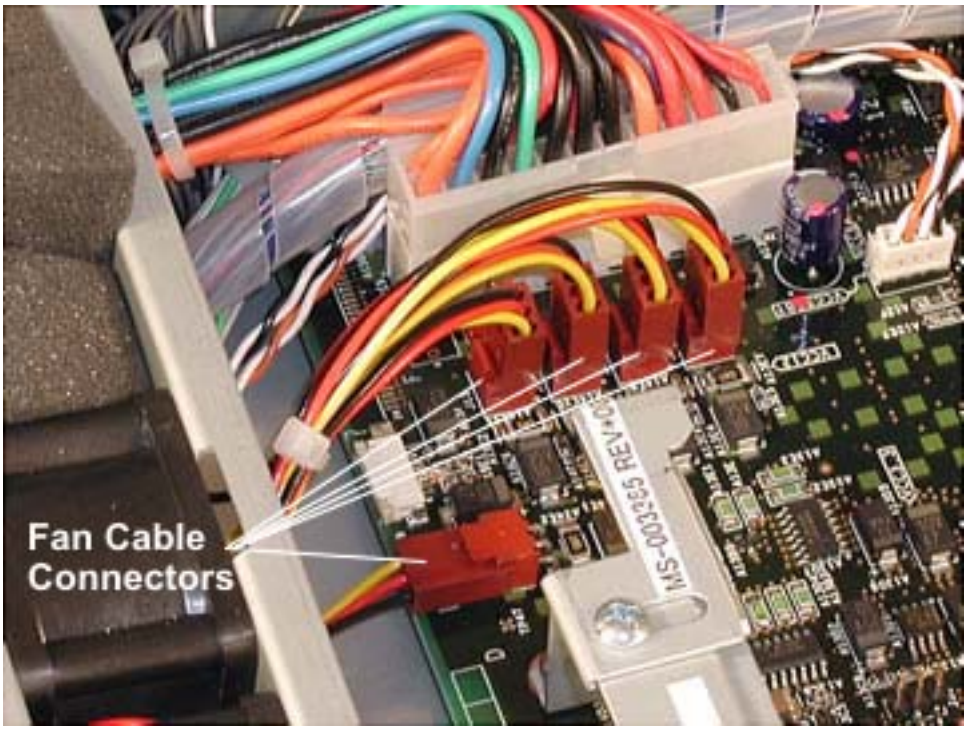
3. Remove the three screws securing the fan assembly.

Figure 4-37. Fan Assembly Screws



4. Disconnect the five fan assembly power cables from the core I/O board.

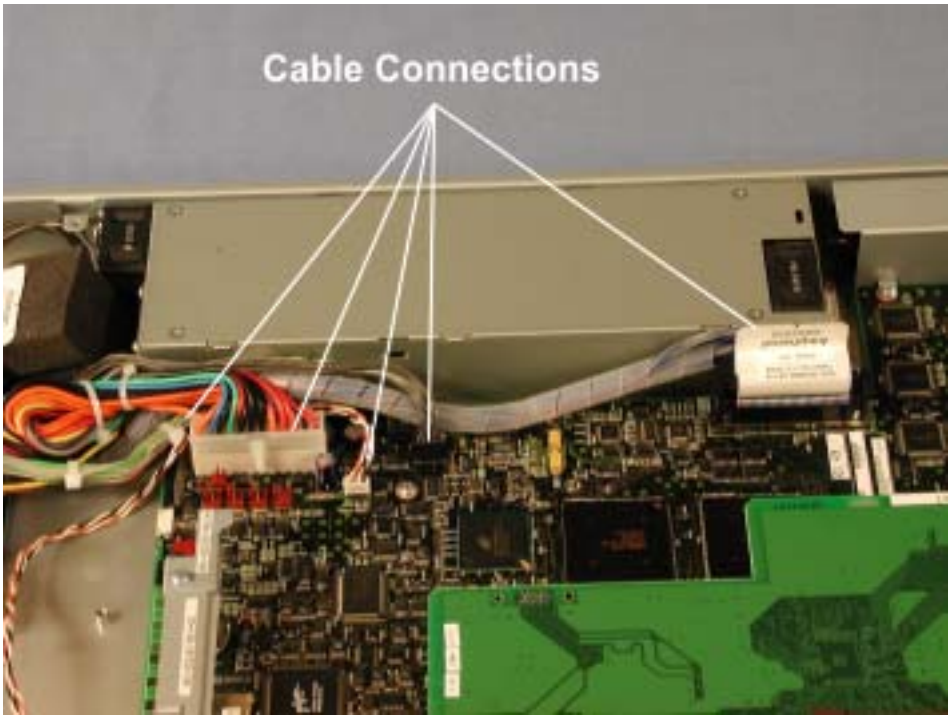
Figure 4-38. Fan Assembly Power Cable Connections



5. Lift the fan assembly straight up to remove it from the enclosure.

6. Disconnect the remaining cables (five total) from the core I/O board.

Figure 4-39. Core I/O Board Cables



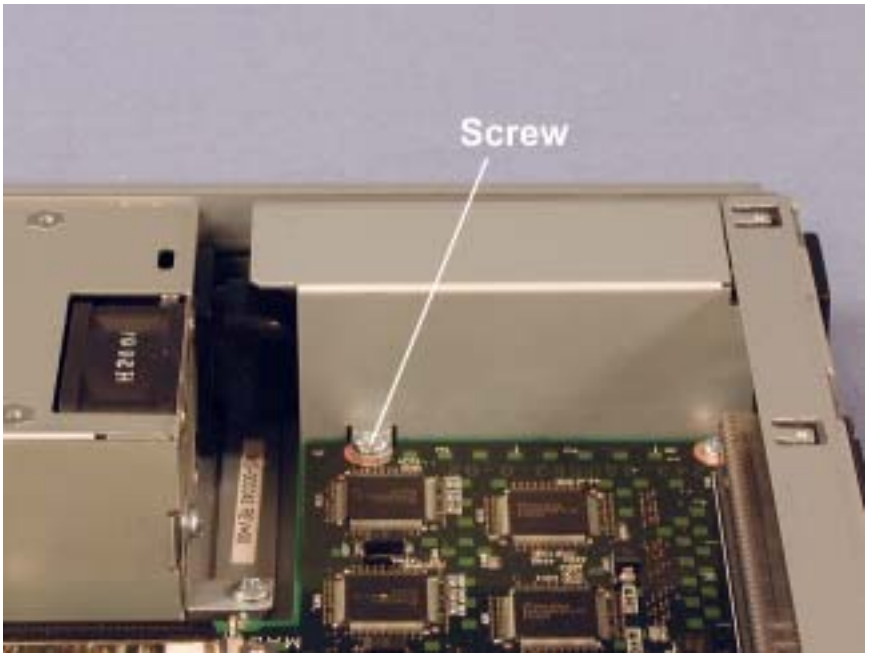
7. Remove each of the PCI adapters as described in Section 3.4.8.
8. Remove the PCI Riser board as described in Section 4.4.7.

9. Remove the two screws securing the PCB stabilizing bracket to the core I/O board.

Figure 4-40. Stabilizing Bracket Screws

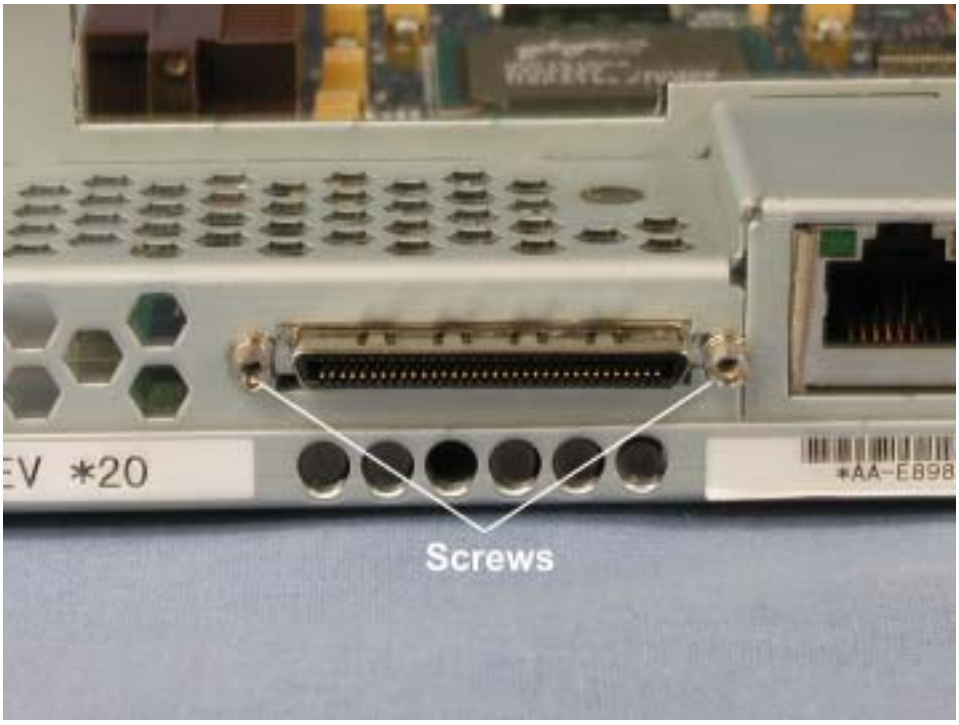
10. Remove the screw securing the AC inlet cover and lift off the cover.

Figure 4-41. AC Inlet Cover Screw



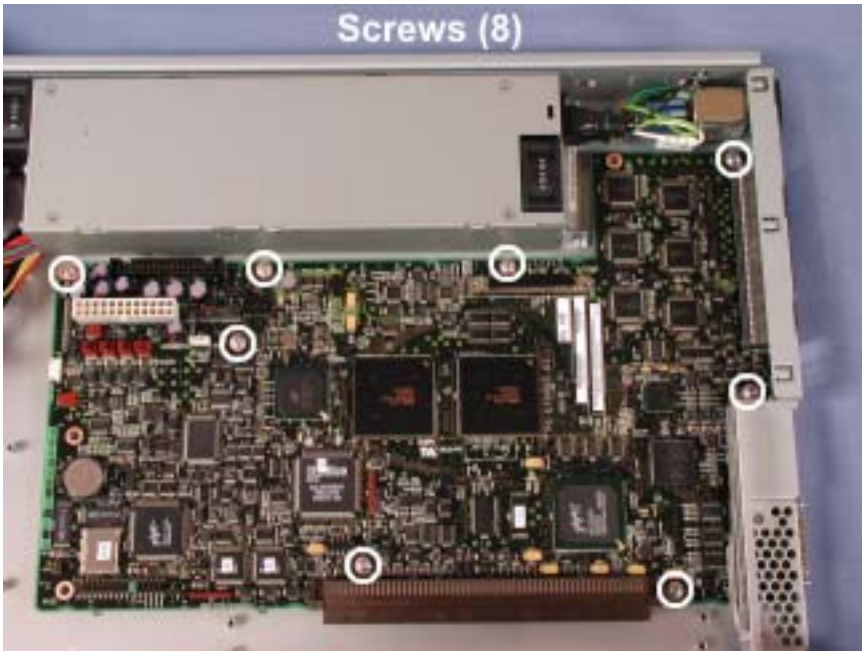
11. Remove the two screws securing the external SCSI connector at the rear of the enclosure.

Figure 4-42. External SCSI Connector Screws



12. Remove the remaining eight screws from the core I/O board.

Figure 4-43. Core I/O Board Screws



13. Carefully lift the end of the core I/O board and pull it slightly forward until the connectors at the rear clear the sheet metal.

4.4.9 CD-ROM Interface Board

1. Remove the core I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Disconnect the cables from the CD-ROM interface board.

Figure 4-44. CD-ROM Interface Board Cables

4. Remove the two screws securing the Interface board.

Figure 4-45. CD-ROM Interface Board Screws

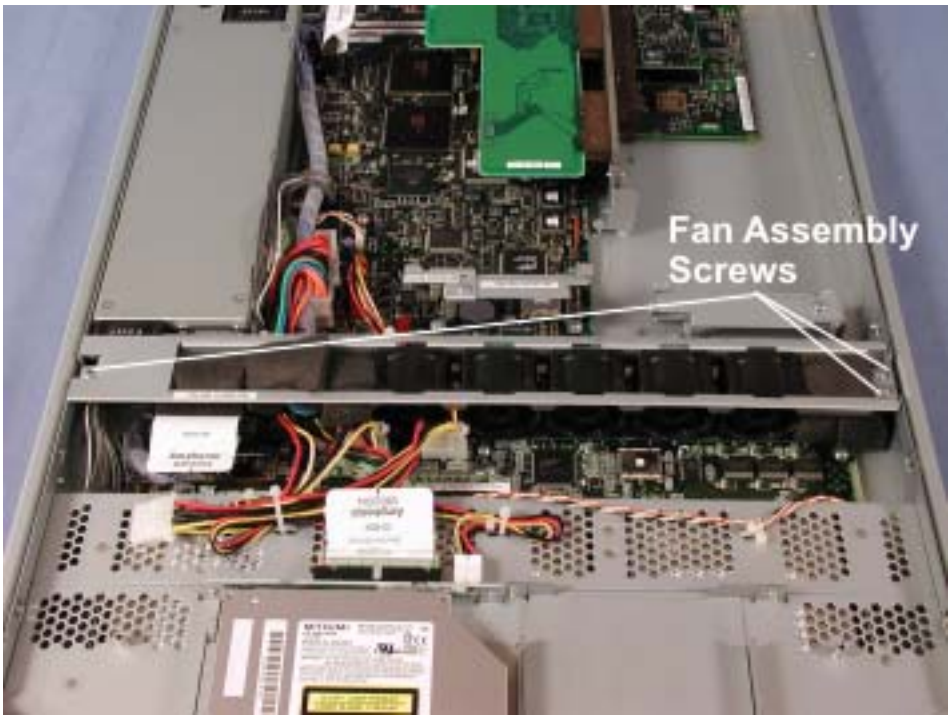
5. Disengage the CD-ROM interface board from the CD-ROM and lift it out.

4.4.10 Core I/O Enclosure SCSI Backplane

1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.

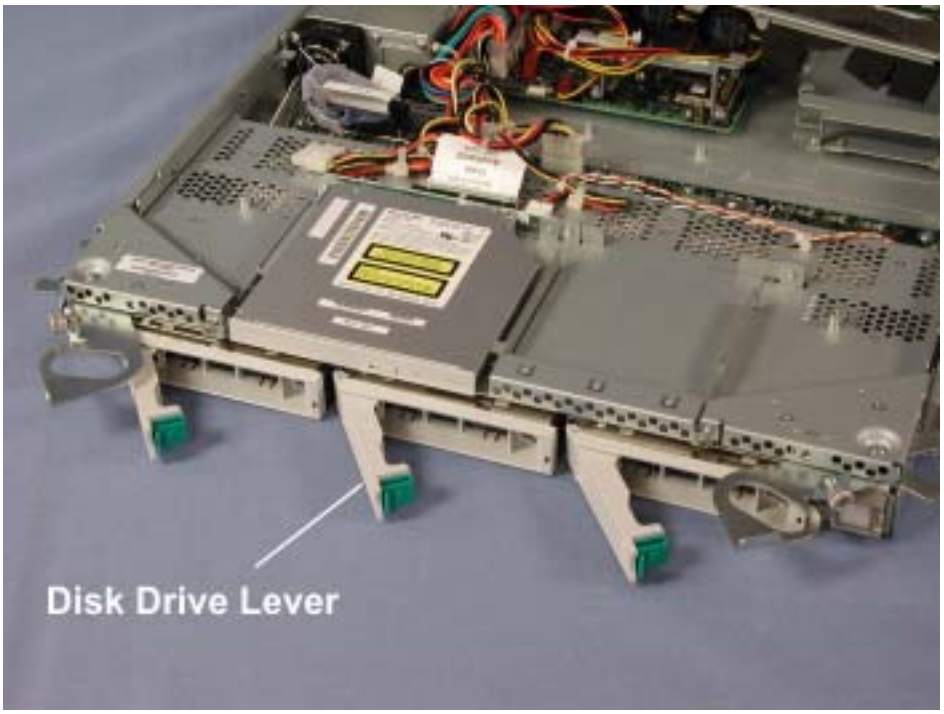
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-46. Fan Assembly Screws



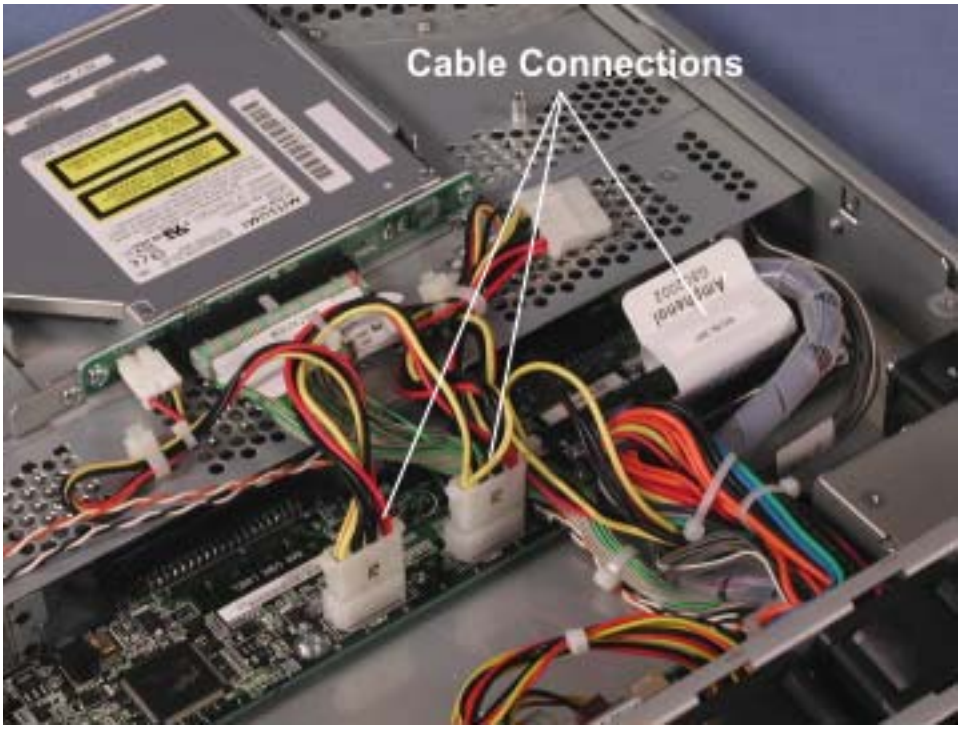
4. Disengage each disk drive from the SCSI backplane by pressing in the green tab at the end of the disk drive lever and pulling the lever out to its fully open position.

Figure 4-47. Disk Drive Lever



5. Disconnect the two power cables and the SCSI cable from the SCSI backplane..

Figure 4-48. SCSI and Power Cables at SCSI Backplane



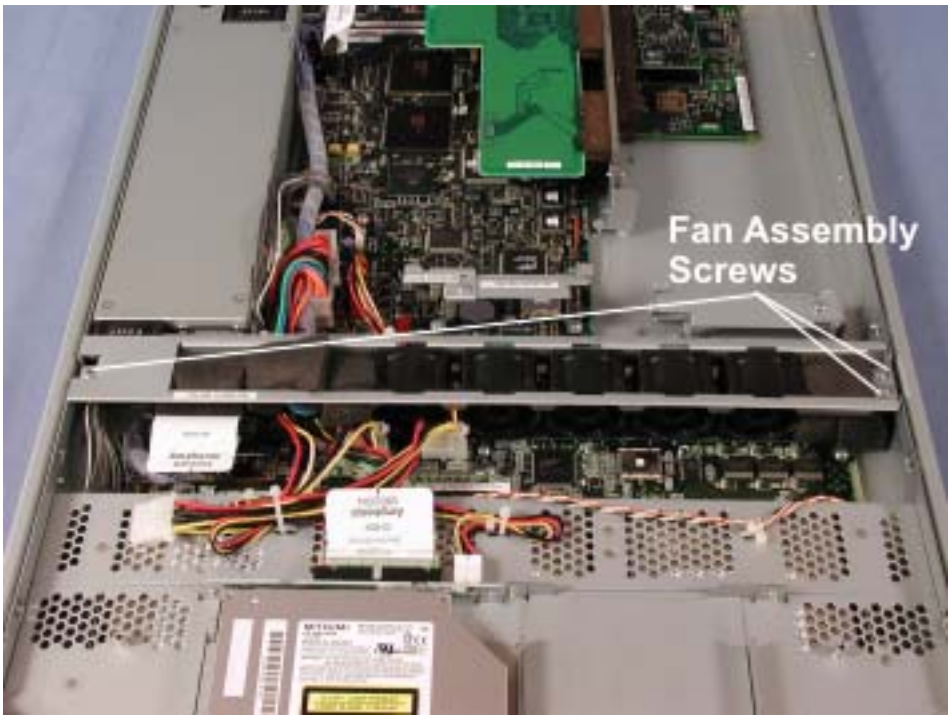
6. Remove the eight screws securing the SCSI backplane and lift it out of the enclosure.

Figure 4-49. SCSI Backplane Screws

4.4.11 Core I/O Enclosure Ground Cable

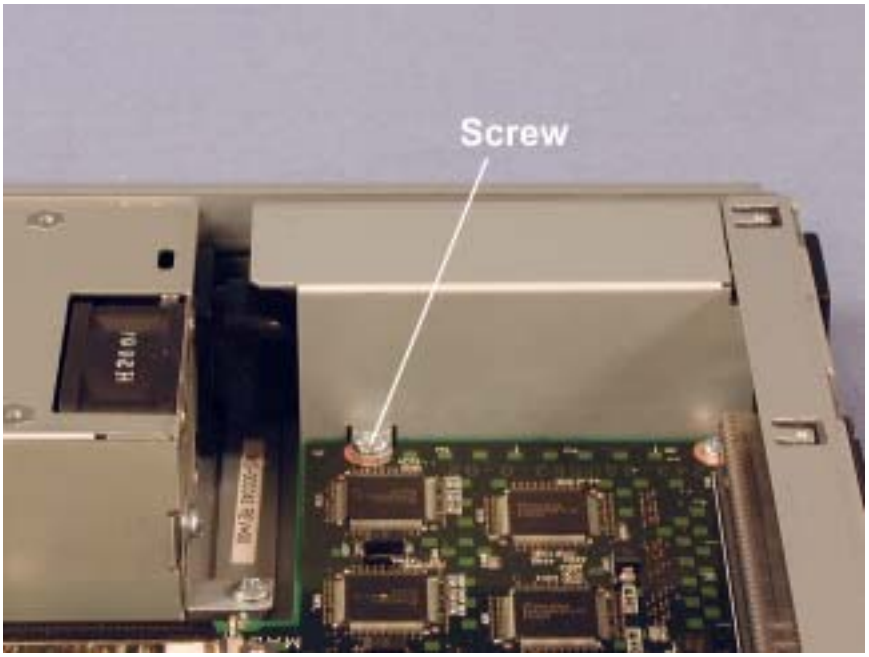
1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-50. Fan Assembly Screws



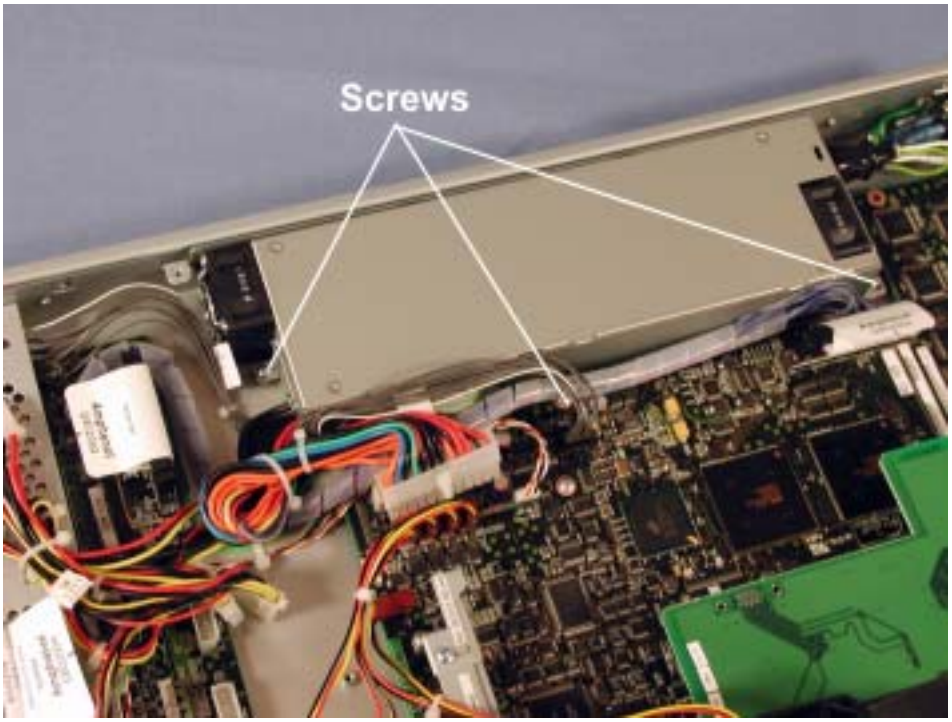
4. Remove the screw securing the AC inlet cover and lift off the cover.

Figure 4-51. AC Inlet Cover Screw



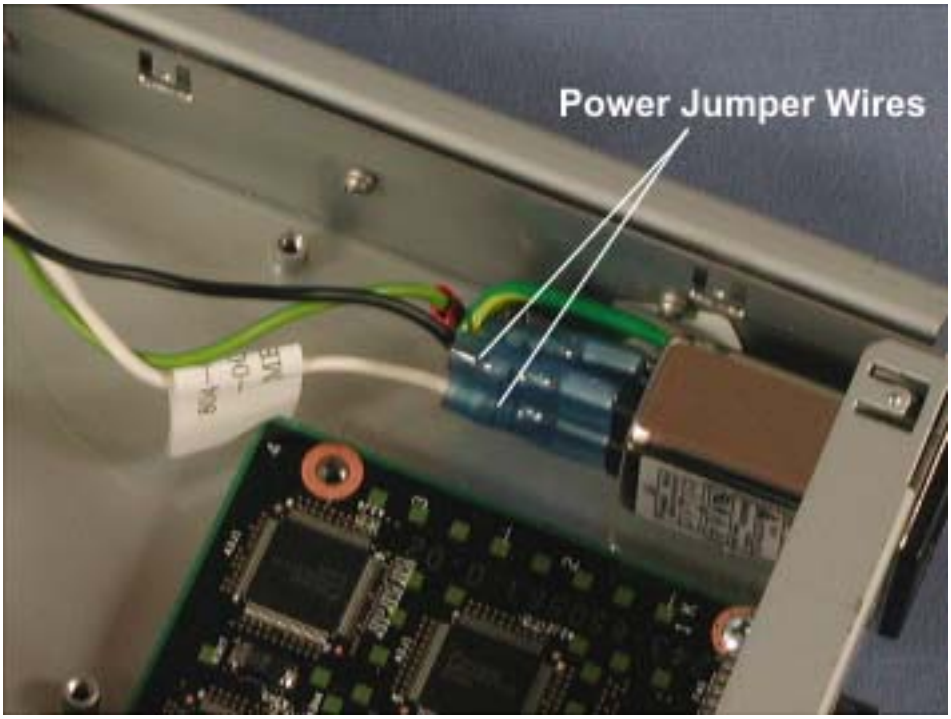
5. Remove the three screws securing the power supply and lift it out of the way. You do not need to disconnect the power connector.

Figure 4-52. Power Supply Screws



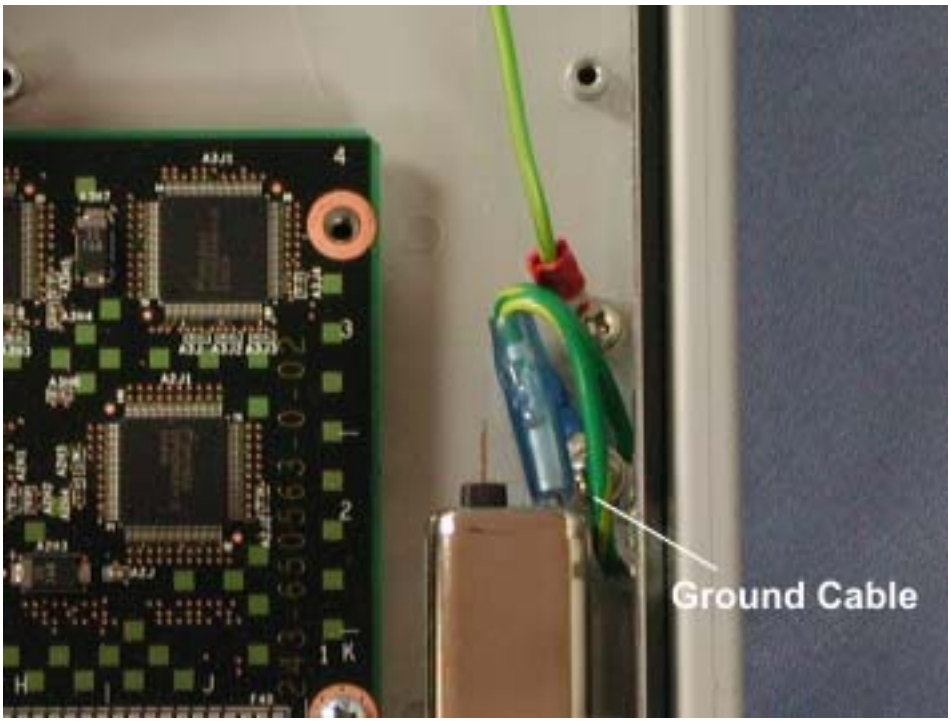
6. Disconnect the black and white wires on the power jumper cable from the AC inlet.

Figure 4-53. Power Jumper Cable Wires at AC Inlet



7. Disconnect the ground cable from the AC inlet.

Figure 4-54. Ground Cable Connection at AC Inlet

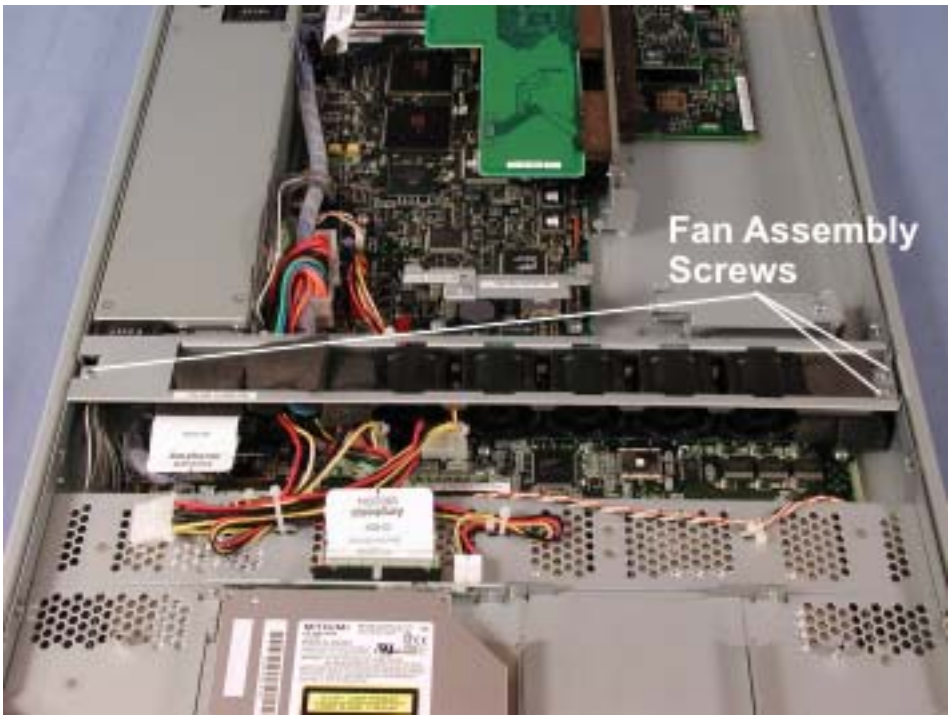


8. Remove the screw securing the ground cable to the enclosure.

4.4.12 Core I/O Enclosure Internal Power Jumper Cable

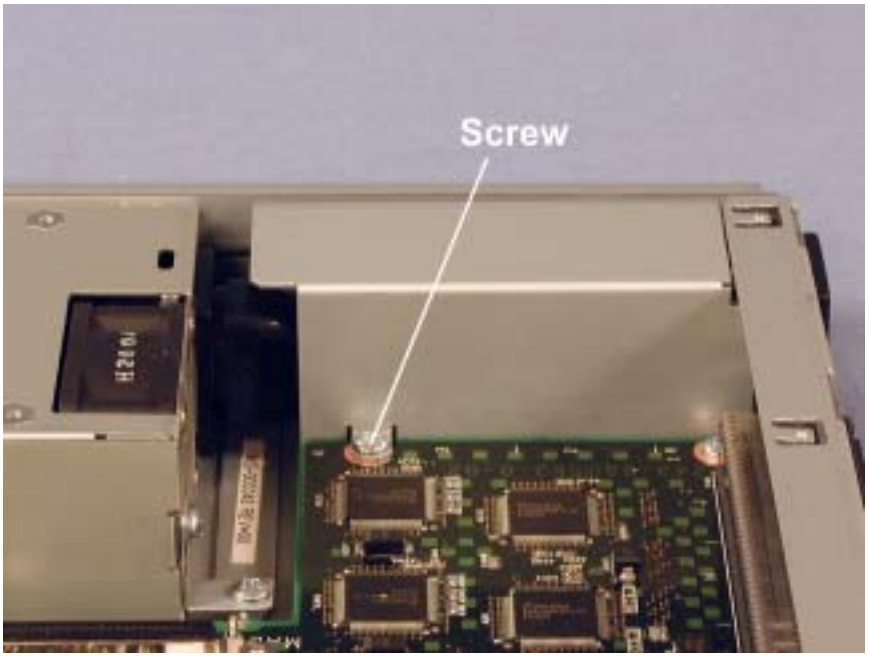
1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-55. Fan Assembly Screws



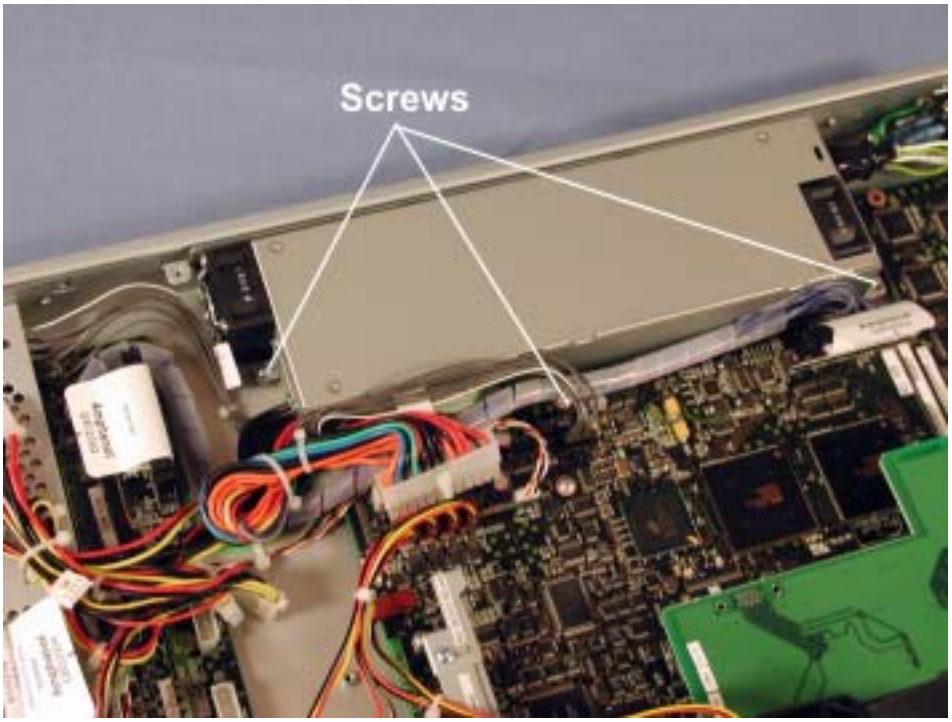
4. Remove the screw securing the AC inlet cover and lift off the cover.

Figure 4-56. AC Inlet Cover Screw



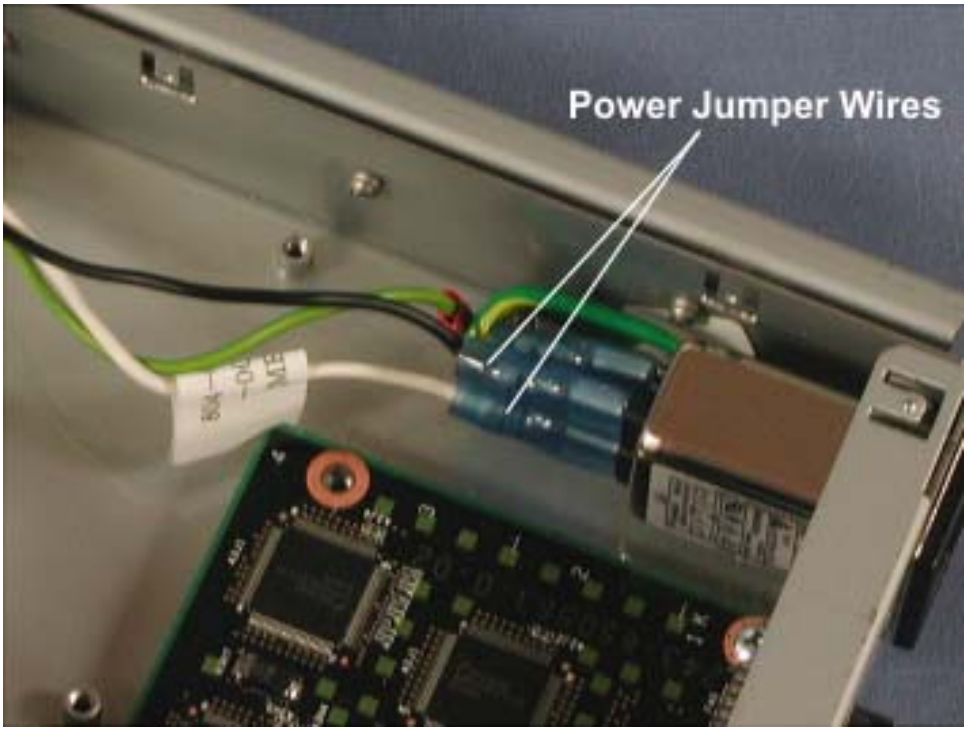
5. Remove the three screws securing the power supply and lift it out of the way. You do not need to disconnect the power connector.

Figure 4-57. Power Supply Screws



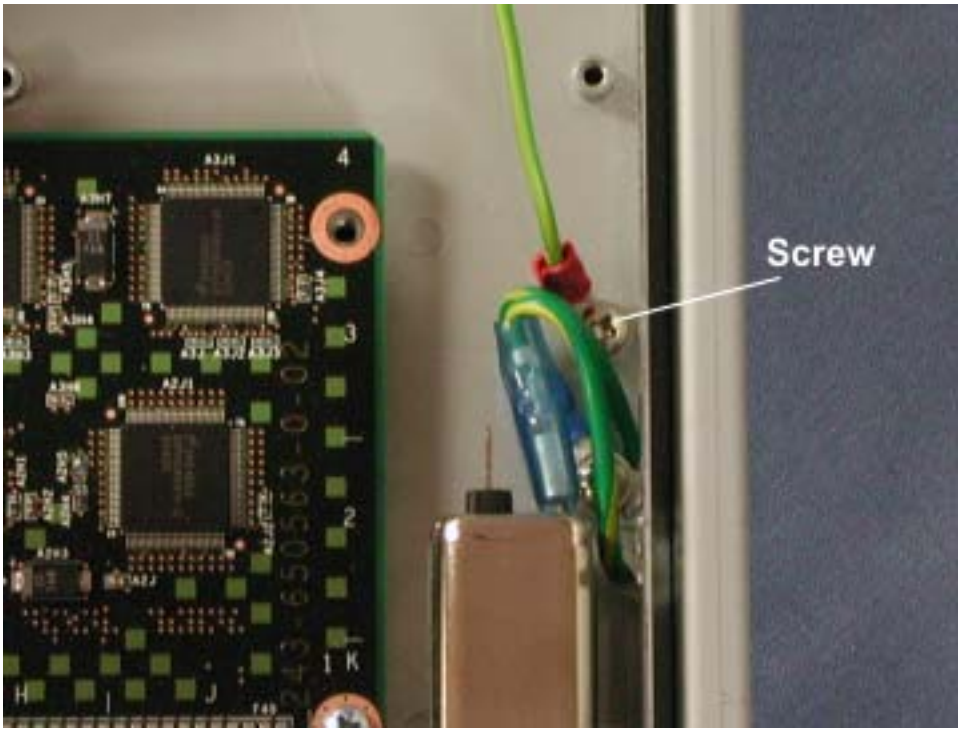
6. Disconnect the black and white wires on the power jumper cable from the AC inlet.

Figure 4-58. Power Jumper Cable Wires at AC Inlet



7. Remove the screw securing the power jumper cable's ground wire to the enclosure.

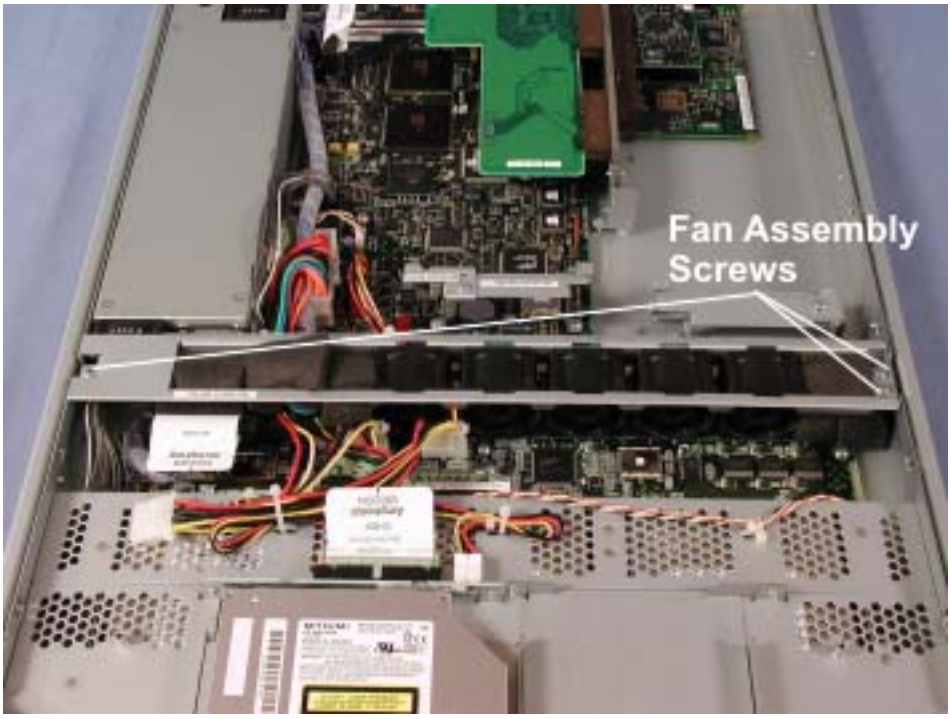
Figure 4-59. Power Jumper Cable Ground Wire



4.4.13 Core I/O Enclosure LED Cable

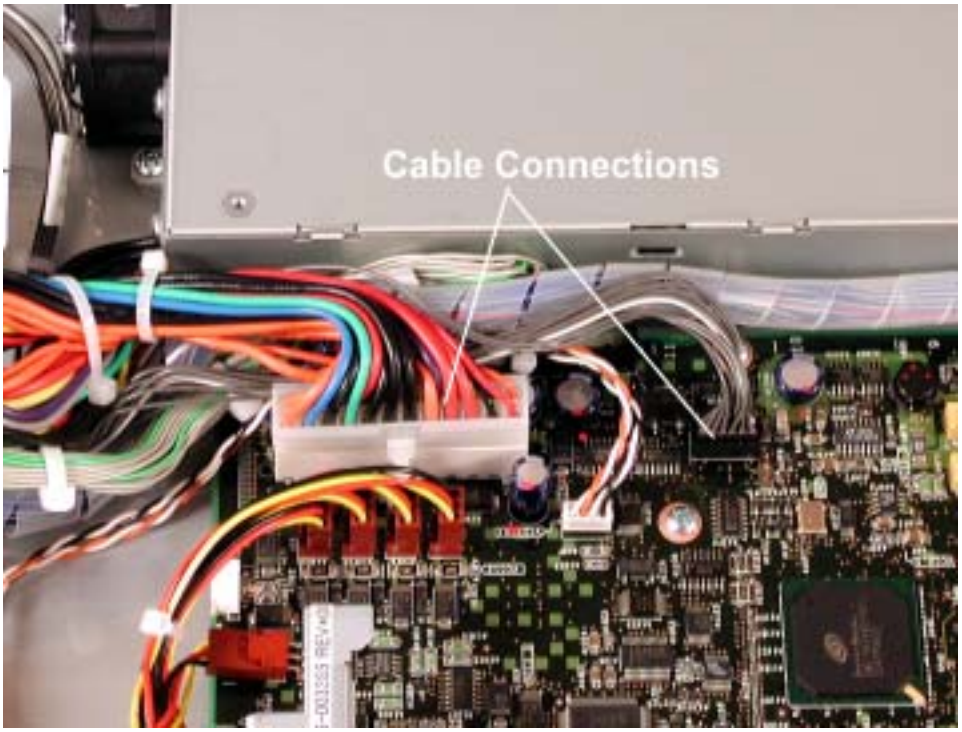
1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-60. Fan Assembly Screws



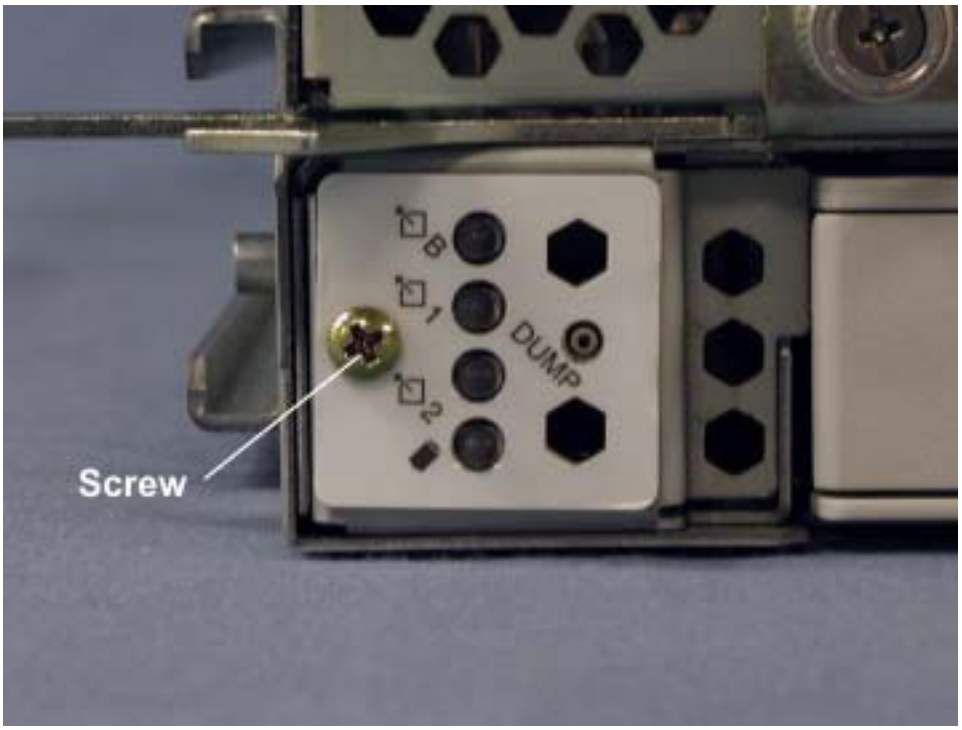
4. Disconnect the power cable and LED cable from the core I/O board.

Figure 4-61. Power Cable and LED Connections at Core I/O Board



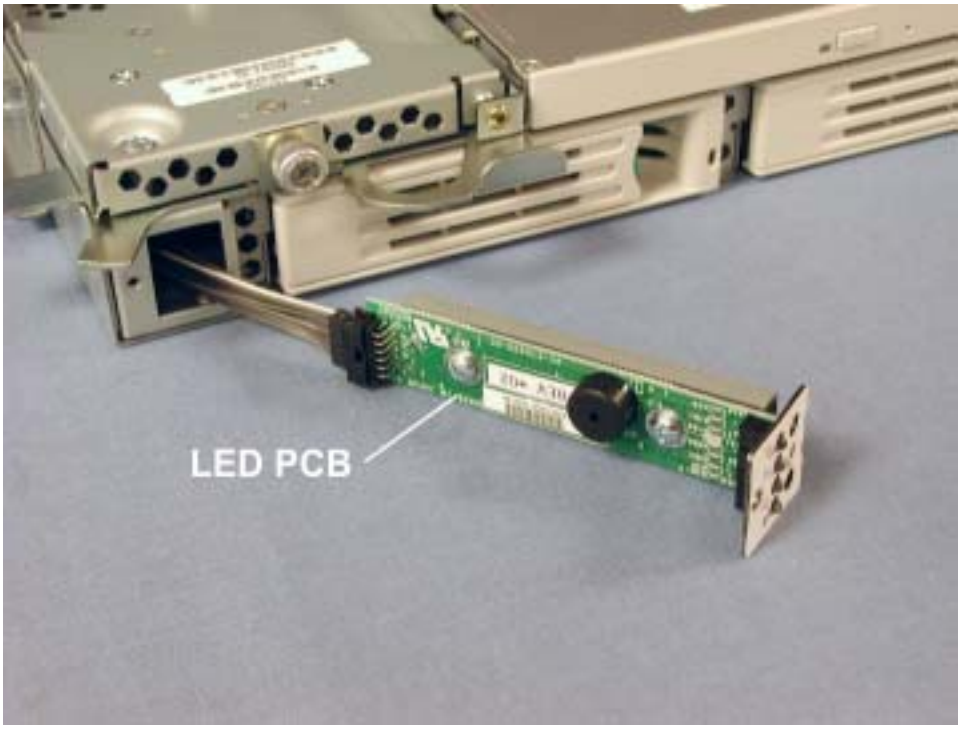
5. Remove the screw in the I/O enclosure LED PCB at the front of the enclosure.

Figure 4-62. I/O Enclosure LED PCB Screw



6. Pull the I/O enclosure LED PCB and cable straight forward and out of the enclosure.

Figure 4-63. Removing LED PCB and Cable



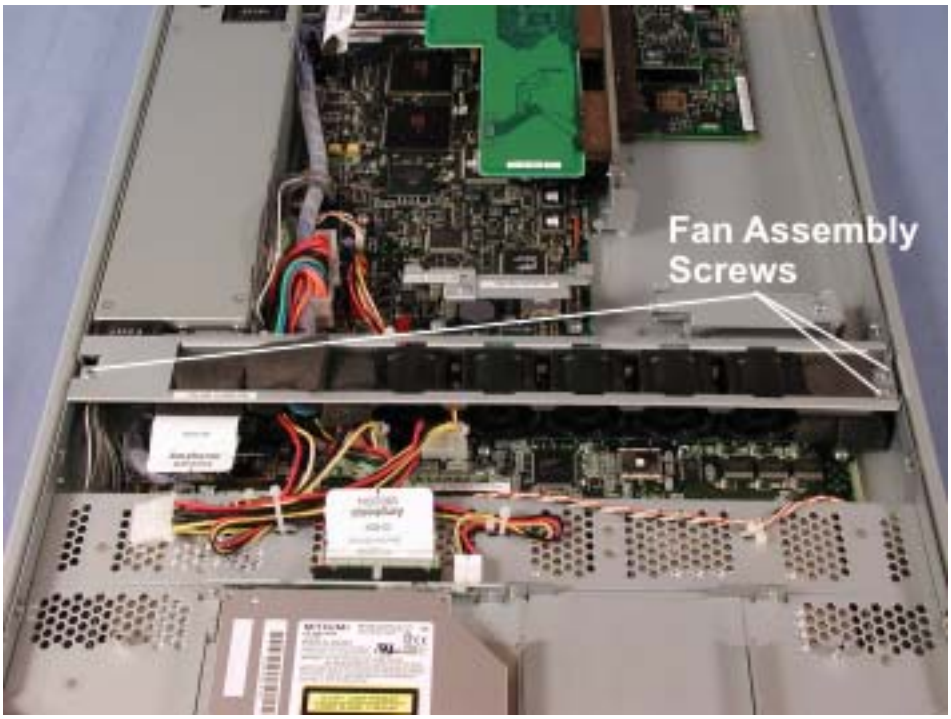
7. Disconnect the LED cable from the back of the LED PCB.

4.4.14 Core I/O Enclosure Power Switch with LED and Guard

1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.

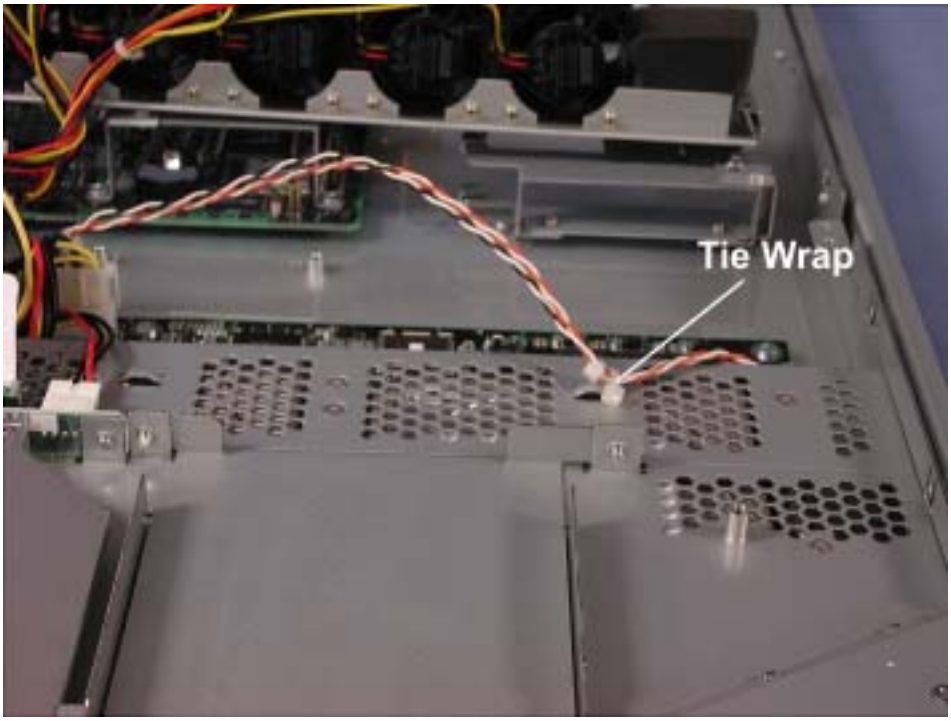
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-64. Fan Assembly Screws



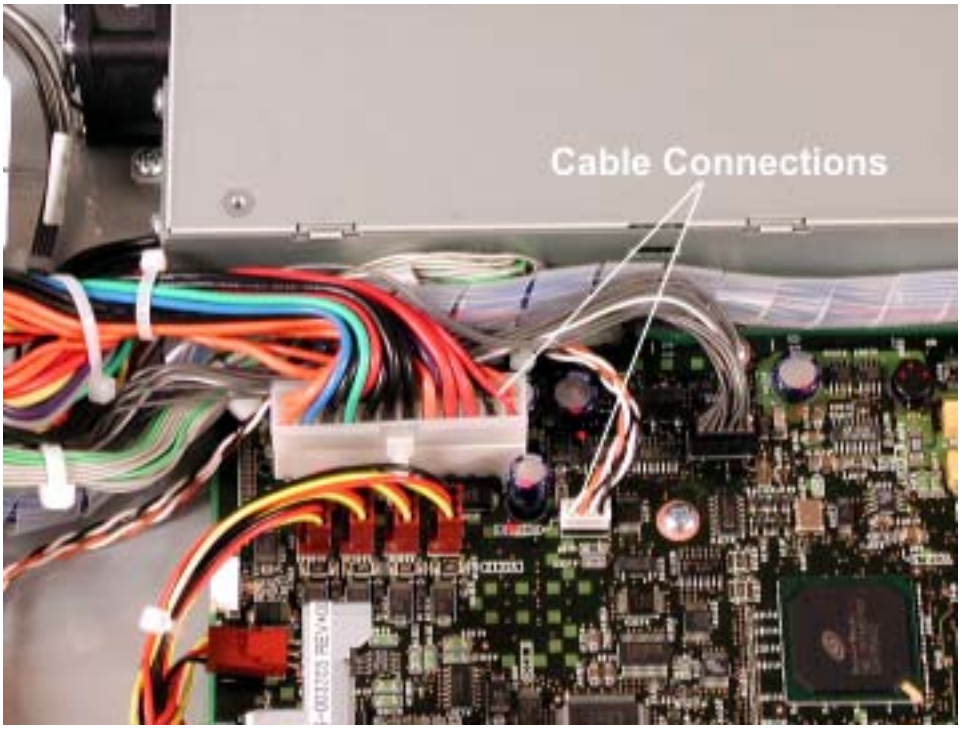
4. Cut the tie wrap securing the power switch cable to the chassis to loosen tension on the cable.

Figure 4-65. Power Switch Cable Tie Wrap



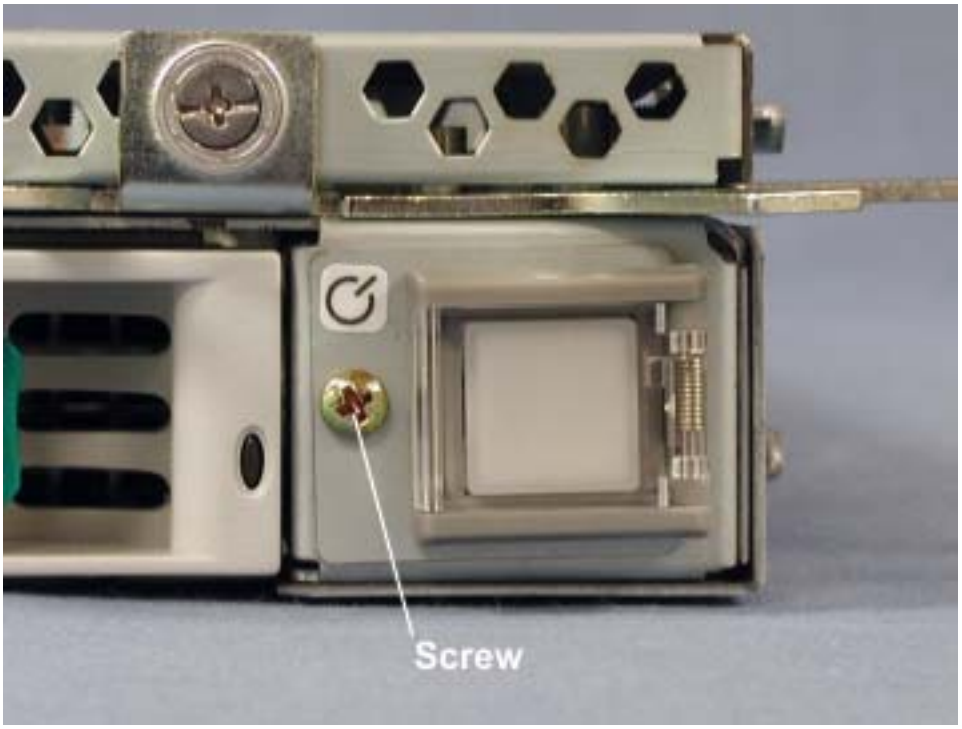
5. Disconnect the power switch cable and power cable at the core I/O board.

Figure 4-66. Power Switch Cable Connection at Core I/O Board



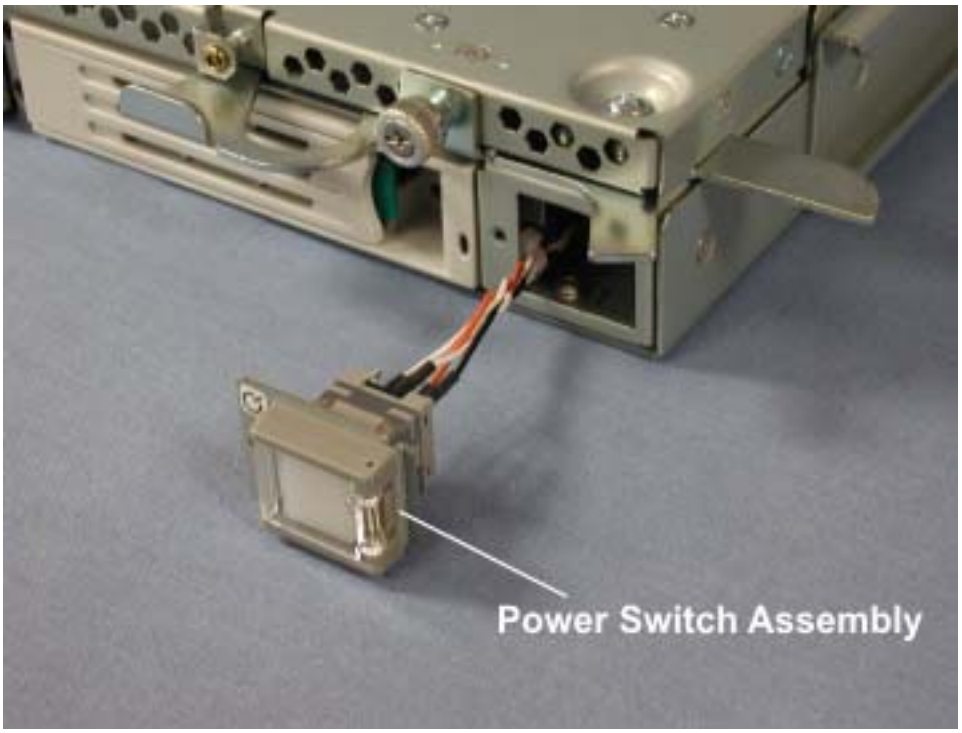
6. At the front of the enclosure, remove the screw securing the power switch assembly cover.

Figure 4-67. Power Switch Assembly Cover Screw



7. Pull the power switch assembly out the front of the I/O enclosure.

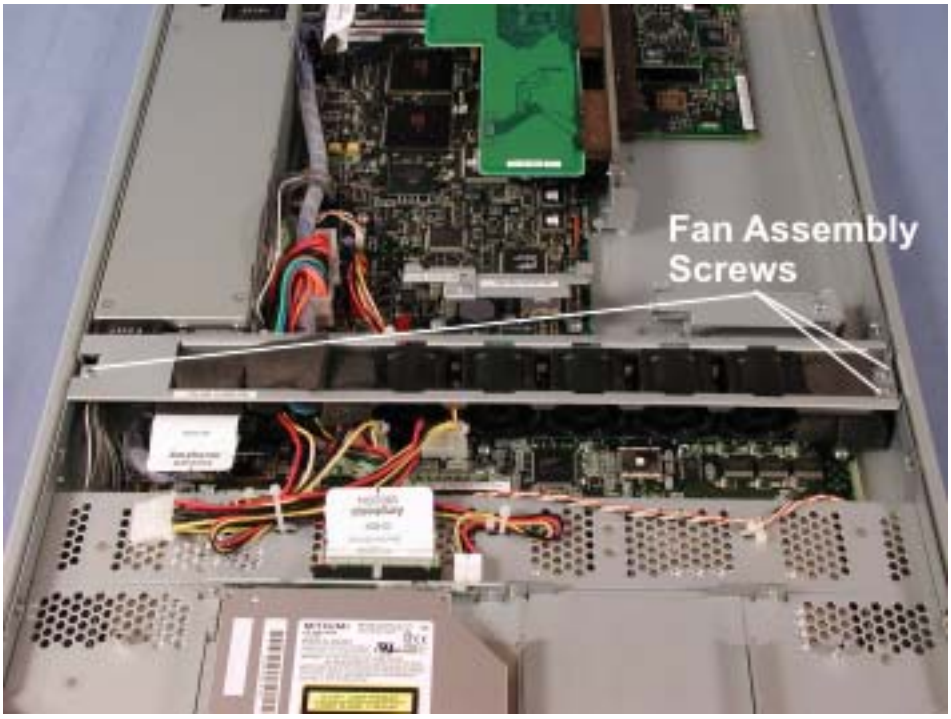
Figure 4-68. Removing Power Switch Assembly



4.4.15 Core I/O Enclosure IDE Cable

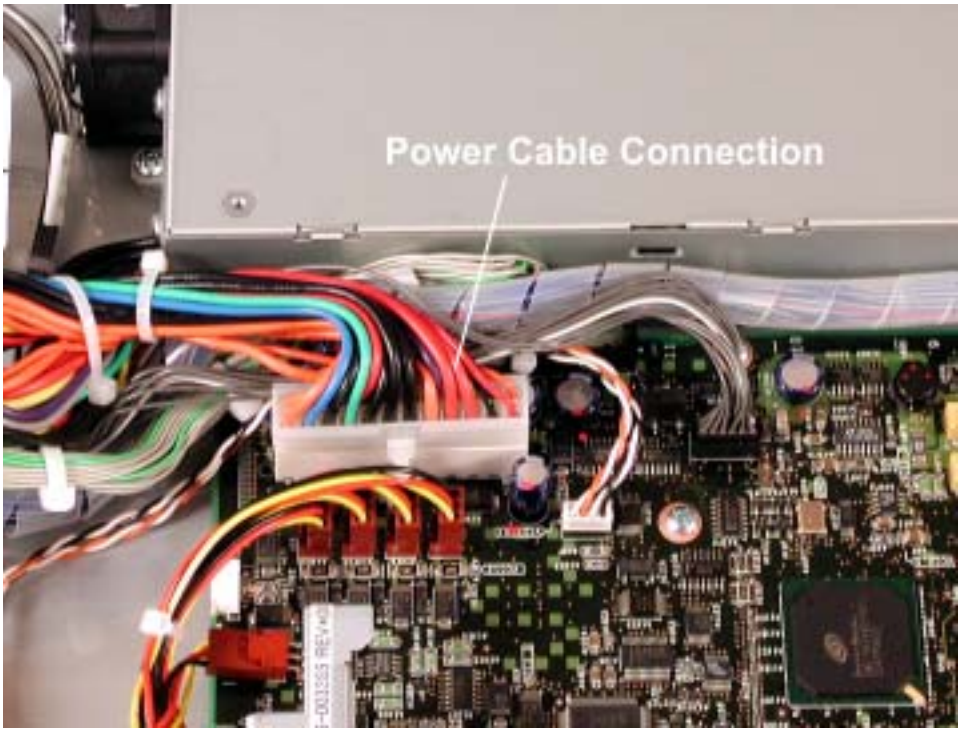
1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-69. Fan Assembly Screws



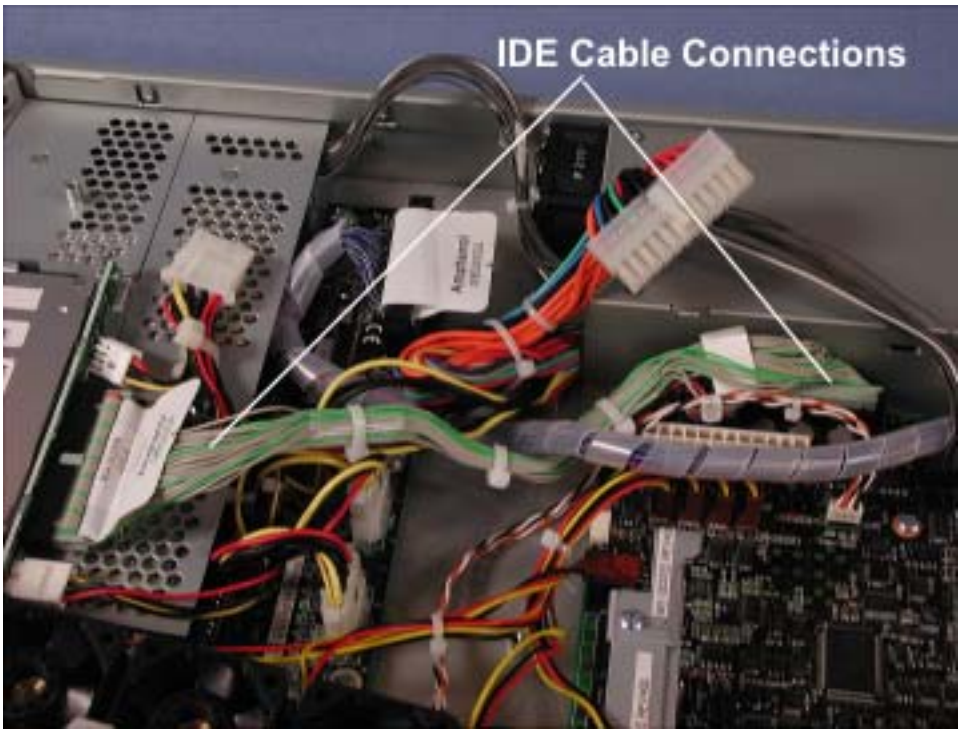
4. Disconnect the power cable at the core I/O board.

Figure 4-70. Power Cable Connection at Core I/O Board



5. Disconnect the IDE cable at the CD-ROM interface board and the core I/O board.

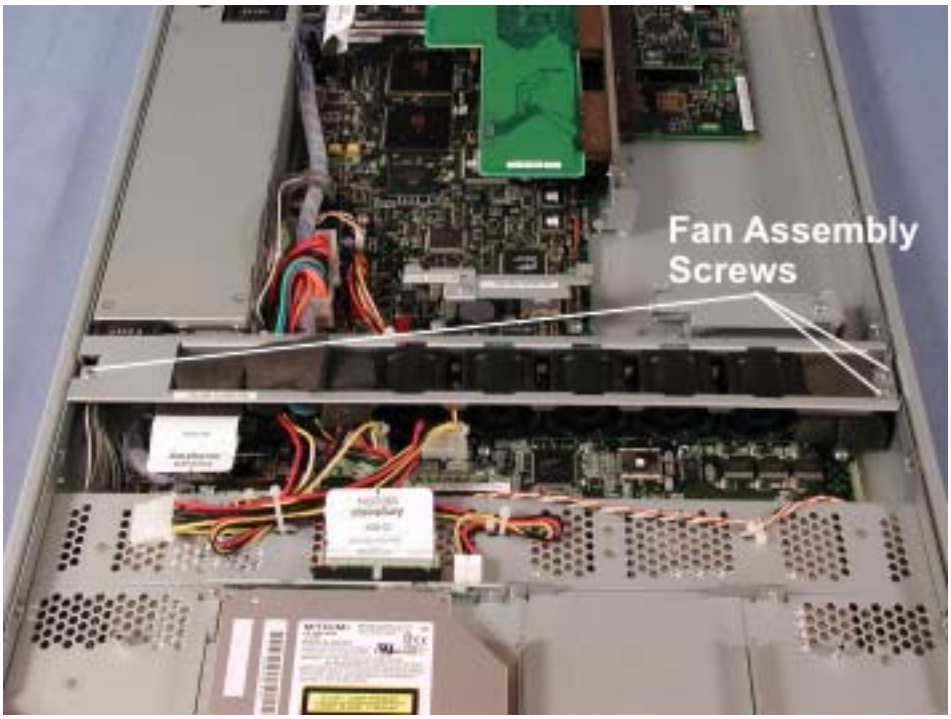
Figure 4-71. IDE Cable Connections at CD-ROM Interface Board and Core I/O Board



4.4.16 Core I/O Enclosure Power Switch

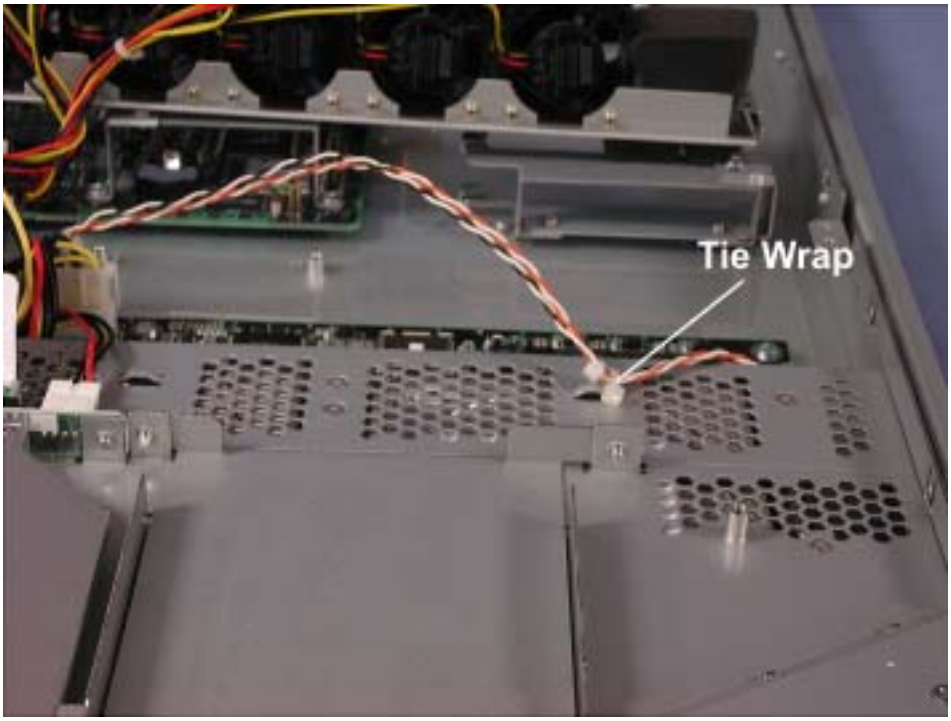
1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.
3. Remove the three screws securing the fan assembly and carefully pull the assembly out of the way. You do not have to remove the fan assembly cables.

Figure 4-72. Fan Assembly Screws



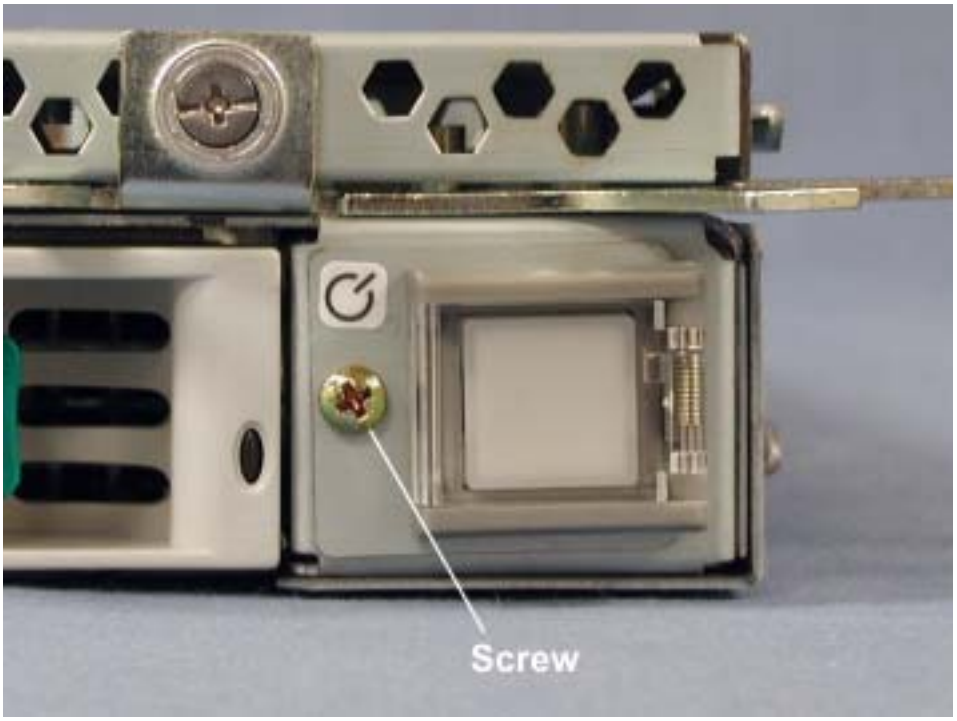
4. Cut the tie wrap securing the power switch cable to loosen the tension on the cable.

Figure 4-73. Power Switch Cable Tie Wrap



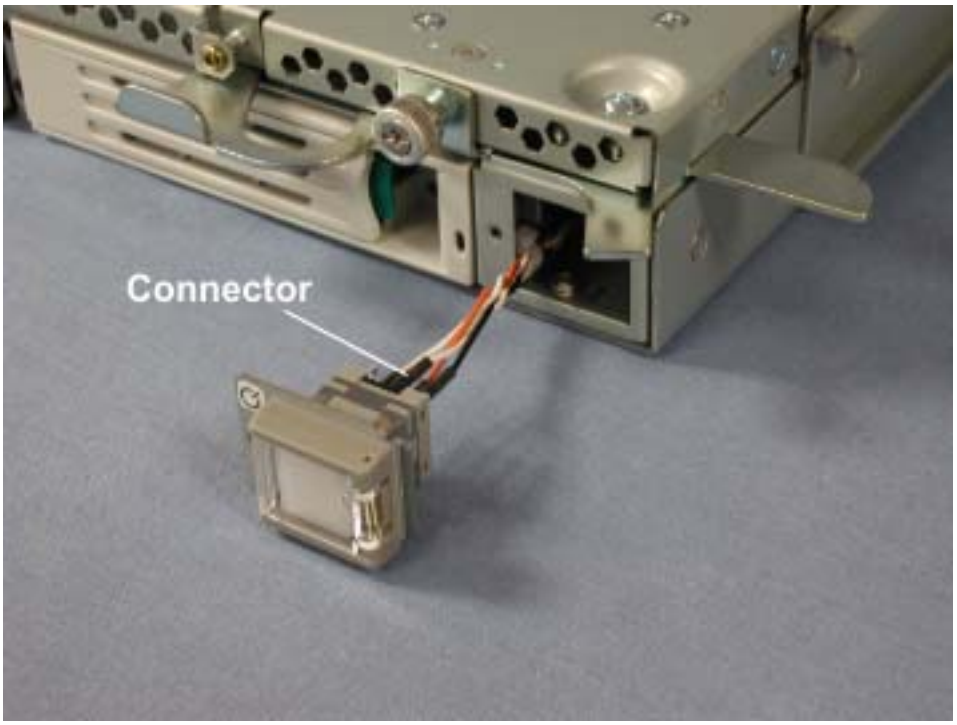
5. At the front of the enclosure, remove the screw securing the power switch cover.

Figure 4-74. Power Switch Cover Screw



6. Pull the power switch slightly out the front of the I/O enclosure and disconnect the cable from the switch.

Figure 4-75. Removing Power Switch

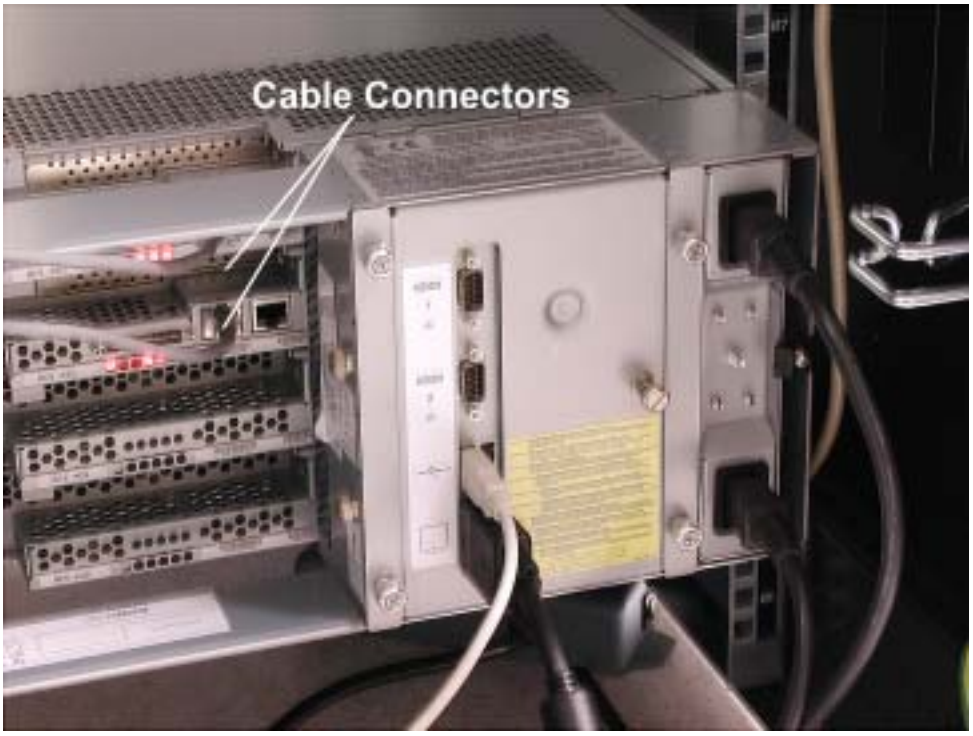


4.4.17 Core I/O Enclosure Ultra 160 SCSI Jumper 68P

1. Remove the I/O enclosure as described in Section 3.4.2.
2. Remove the I/O enclosure cover as described in Section 3.4.3.

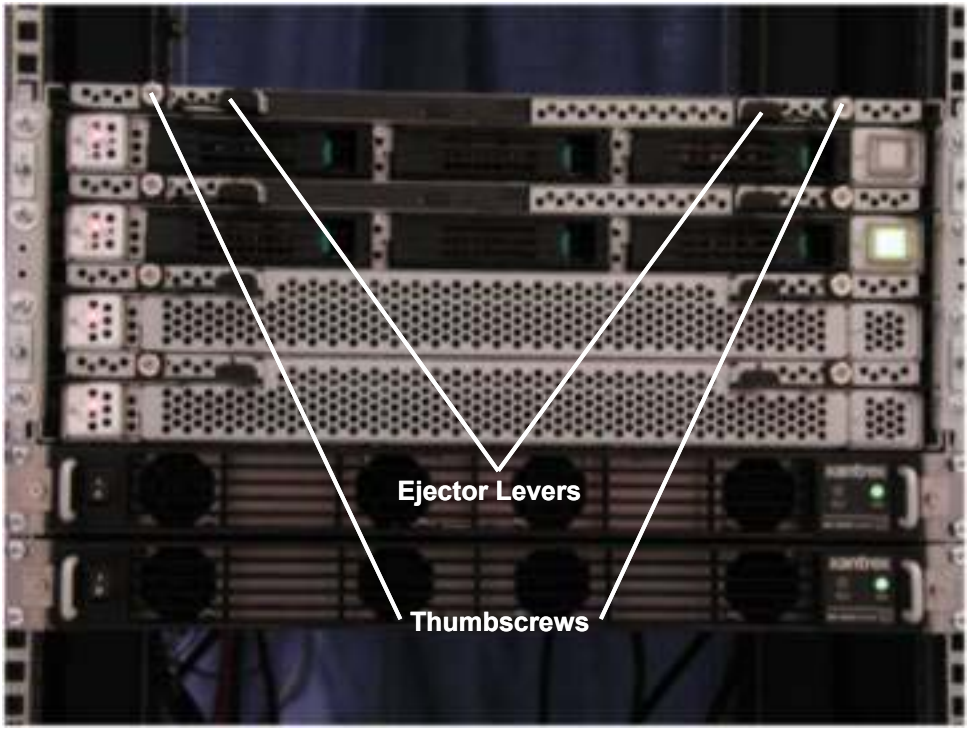
3. Disconnect all cables from the back of the enclosure.

Figure 4-76. I/O Enclosure Cables



4. Loosen the two thumbscrews at the front of the enclosure.

Figure 4-77. I/O Enclosure Thumbscrews



5. Carefully pull the enclosure straight out until it stops. Press down on the stop lever on the right side of the enclosure and pull the enclosure all the way out.

Figure 4-78. Removing I/O Enclosure

6. Remove the three screws securing the enclosure cover.

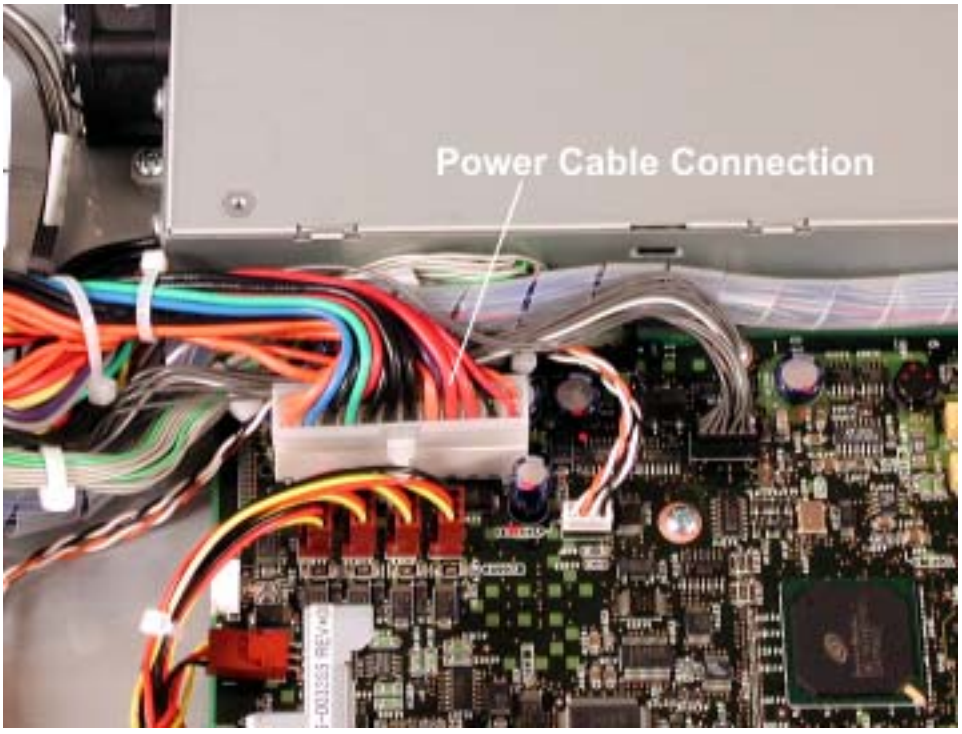
Figure 4-79. Enclosure Cover Screws

7. Slide the cover straight back towards the rear of the enclosure.

Figure 4-80. Removing Enclosure Cover

8. Disconnect the power cable from the core I/O board.

Figure 4-81. Power Cable Connection at Core I/O Board



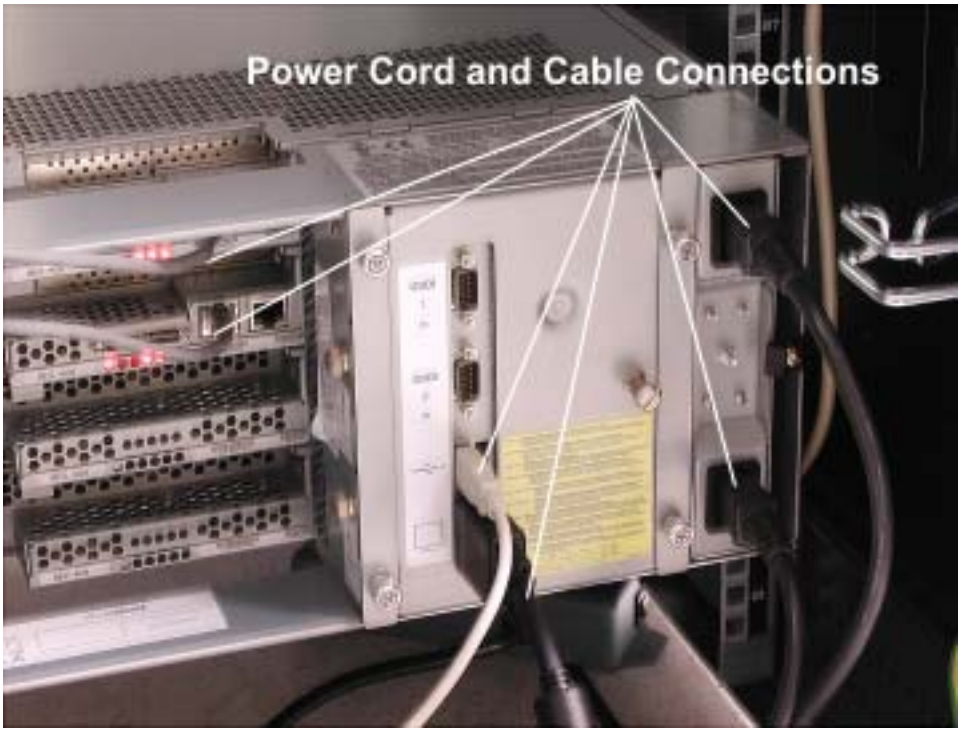
9. Disconnect the Ultra160 SCSI jumper from the SCSI backplane and the core I/O board and lift it out of the enclosure.

Figure 4-82. Ultra160 SCSI Jumper Connections

4.4.18 AC Distribution Assembly

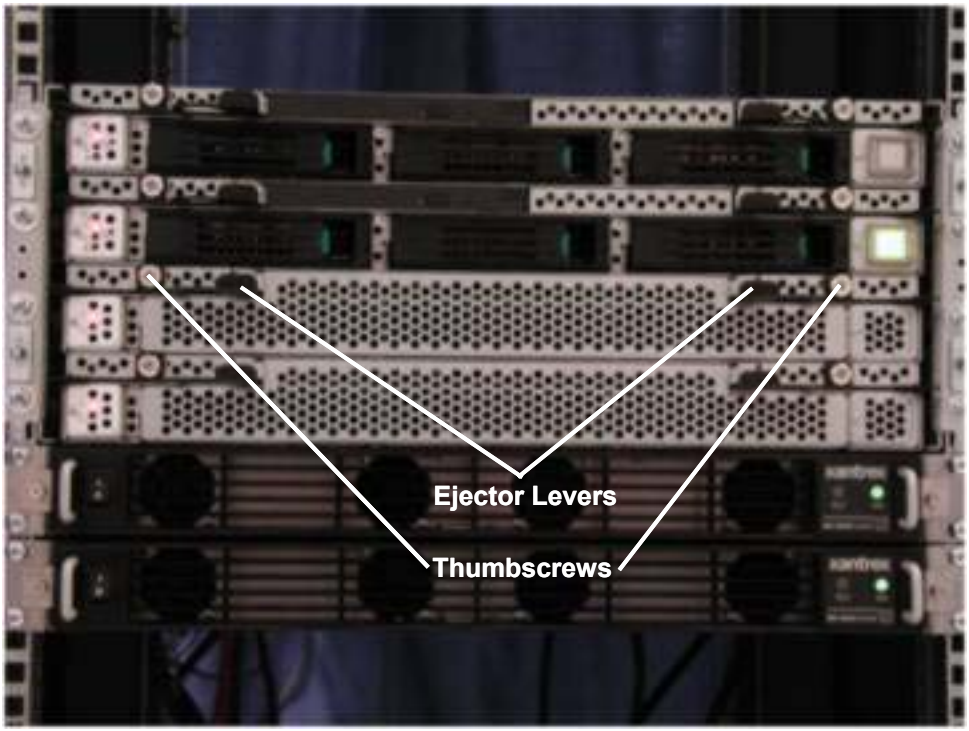
1. Shut down the ftServer system as described in Section 3.3.
2. At the rear of the cabinet, disconnect the power cords from the AC distribution assembly and all the cables connected to the connector I/O PCB and the PCI adapters.

Figure 4-83. Power Cord and Cable Connections at Rear of Cabinet.



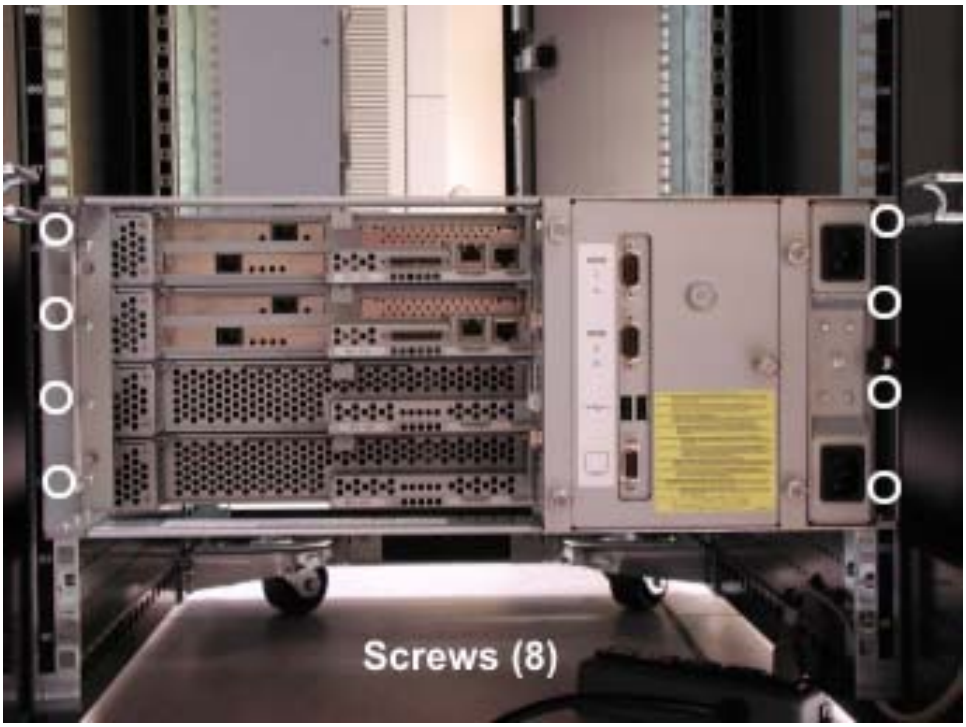
3. At the front of the cabinet, loosen the two thumbscrews on the front of each CPU and I/O enclosure and open the ejector levers to disengage all the enclosures from the backplane.

Figure 4-84. CPU and I/O Enclosure Thumbscrews and Ejector Levers



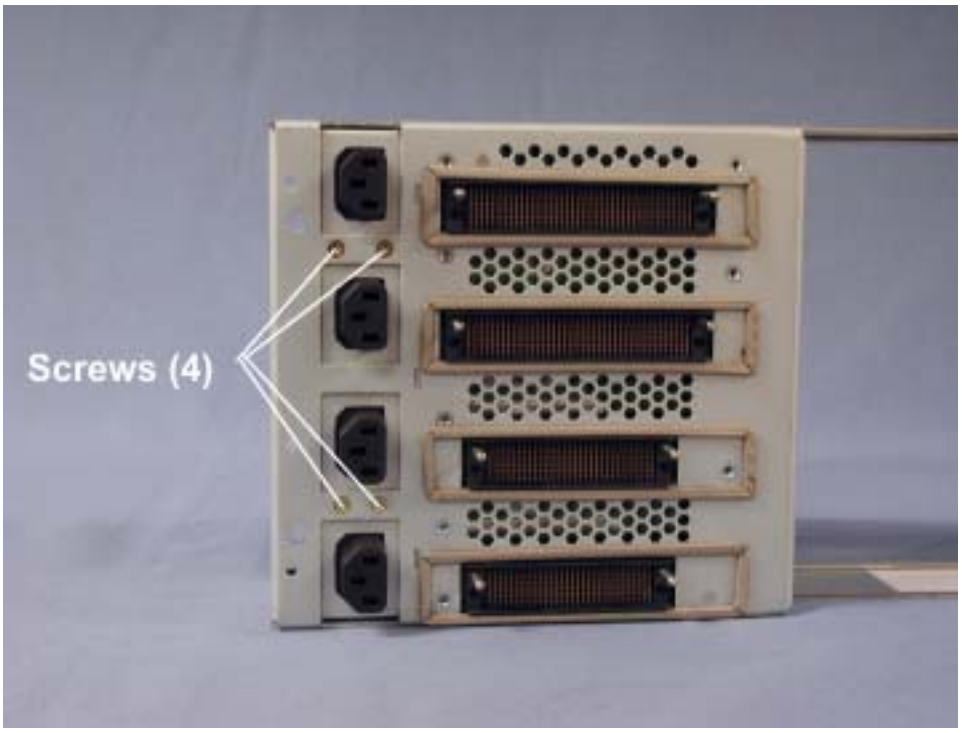
4. Remove the eight screws (four on each side) that secure the backplane assembly to the rails.

Figure 3-30. Backplane Assembly Screws



5. Using both hands, pull the backplane assembly straight out of the rails and set it on a stable surface.
6. Remove the 4 screws securing the AC distribution assembly to the backplane.

Figure 4-85. AC Distribution Screws



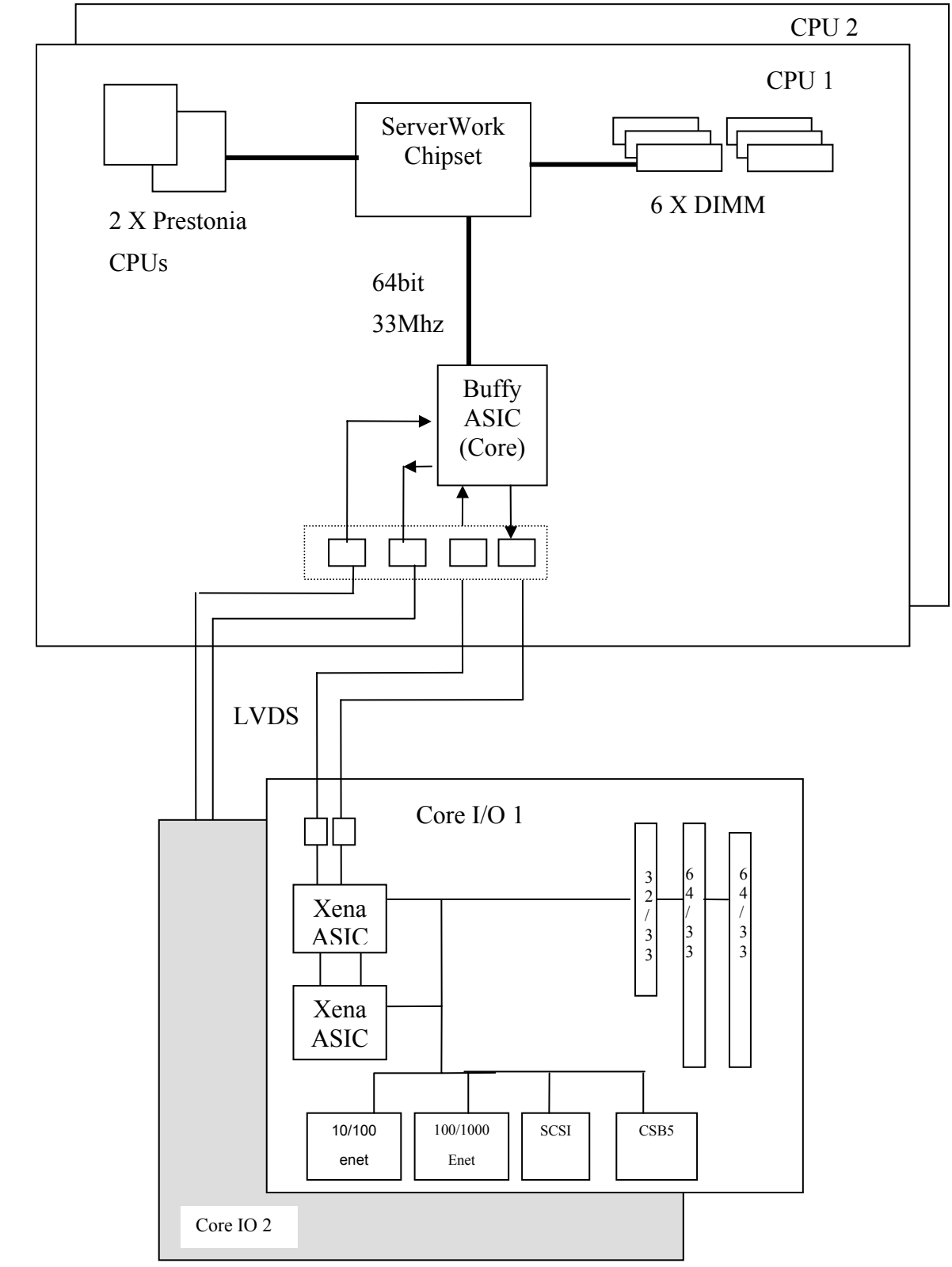
5. Theory of Operation

This section contains an overview of the theory of operation for the ftServer T30 systems. It provides information on how the system operates and includes a description of each of the following major assemblies/subsystems.

- CPU Enclosure
- I/O Enclosure
- 4U Backplane
- DC/AC Inverter
- Tape Subsystem
- Power Subsystem
- Cooling Subsystem

The figure on the following page is a block diagram of the ftServer T30 system.

Figure 5-1. ftServer T30 Block Diagram

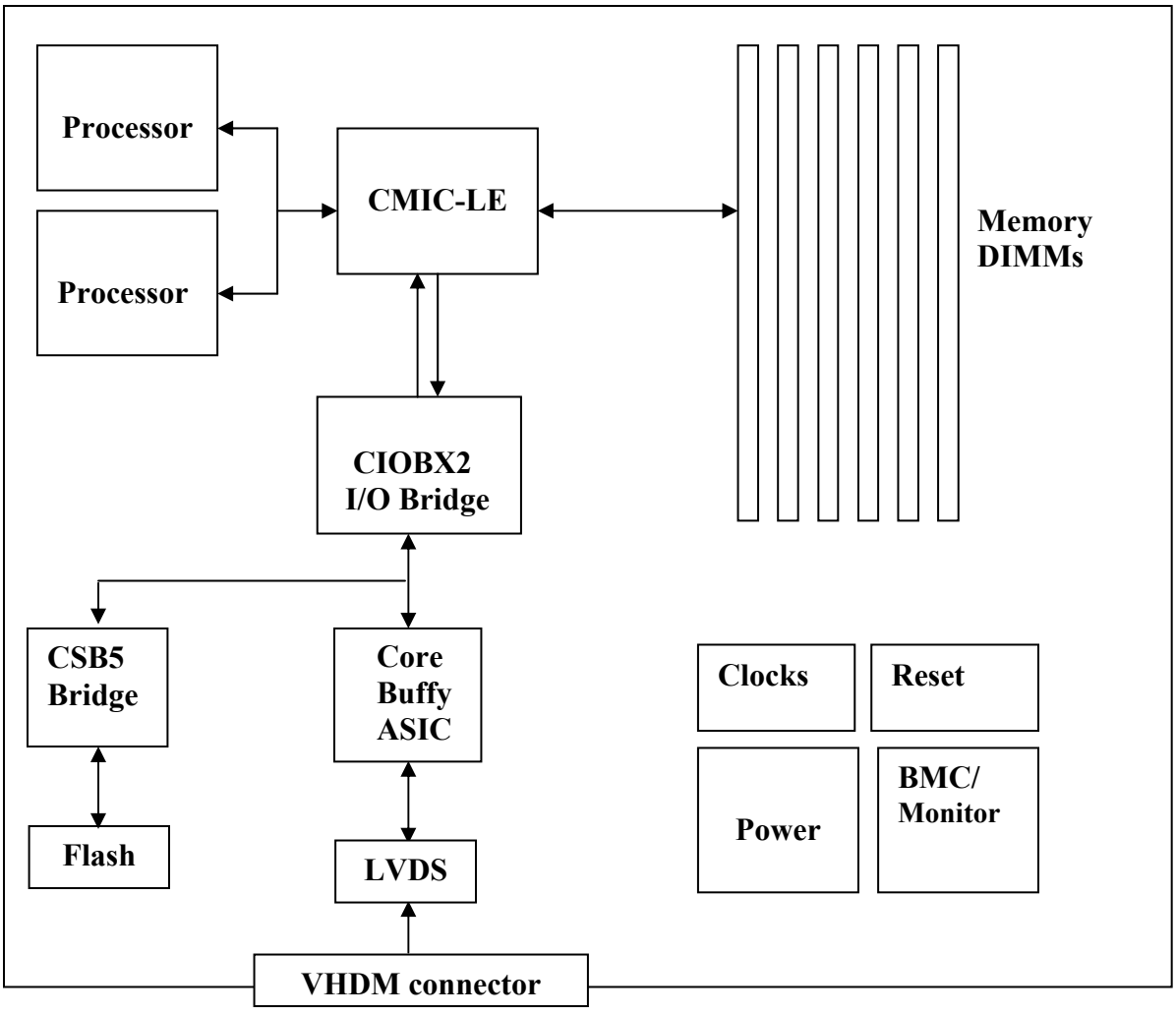


5.1 CPU Enclosure

The ftServer T30 CPU enclosure is based on the Intel Xeon processor 'Prestonia' using the ServerWorks Grand Champion LE and CIOB-X2 PCI bridge to interface to a pair of Buffy ASICs, which provide the fault tolerant interface between the CPU enclosure and the I/O enclosures within the system. The enclosure is partnered with a duplicate CPU enclosure running in lockstep. In the event of a failure, the failing CPU enclosure is removed from service and the partner CPU enclosure continues to run without system interruption.

The following figure is a block diagram of the CPU enclosure.

Figure 5-2. CPU Enclosure Block Diagram



5.1.1 Processor

The Prestonia CPU operates at 2.4 GHz with 512 KB iL2 cache. The processor front side bus (FSB) operates at 400 MHz.

To improve processor throughput the Prestonia architecture supports a feature called “pumping.” This means that multiple transfers occur per FSB clock cycle. Address cycles are double pumped, meaning address information is transferred on each rising and falling clock edge. Data cycles are quad pumped with data transfers occurring four times during each FSB clock cycle. This allows a maximum data transfer rate of 3.2 Gbytes/sec. between the CPU and the Grand Champion LE.

5.1.2 Grand Champion LE

The Grand Champion LE from ServerWorks serves as the interface between the CPU, memory and the CIOB-X2 I/O bridge. It provides three IMB busses, two 16-bit full duplex, double pumped, busses operating at 800 MHz (400 MHz physical) and one 4 bit uni-directional bus also double pumped to operate at 400Mhz (200Mhz physical). Of these three IMB busses only one of the 16-bit IMB busses is used to communicate with the CIOB-X2 I/O bridge, providing an interface with a maximum bandwidth of 1.6 Gbytes between the devices.

The memory interface of the CMIC can support up to 8 Double Data Rate (DDR) DIMMs with up to 16 Gbytes of RAM. The memory bus operates at a frequency of 200 MHz (100 MHz double pumped) and has a maximum bandwidth of 3.2 Gbytes/second. Due to memory interleaving the DIMM sockets must be populated in pairs, starting with DIMM sockets 1 and 2.

5.1.3 CIOB-X2 IO Bridge

The CIOB-X2 provides an interface for two PCI or PCI-X busses. The CIOB-X2 to provides the PCI bus, which is a 64bit/33 MHz bus that connects to the Core Buffy ASIC.

5.1.4 BIOS Flash

The CPU motherboard contains a 1-Mbyte flash device that is used to store the BIOS code. This device stores the code required to initialize the hardware, verify the integrity of the hardware, and boot the system to the start of the OS initialization.

The BIOS can be upgraded in a running system using the ftServer management utility.

5.1.5 CSB5

The T30 system contains a minimum of four CSB5 bridges, one on CPU board and one per Core I/O enclosure. The CSB5 captures accesses to the BIOS flash. It is also used to encode interrupts from the Buffy ASIC to be sent to the CMIC as a PCI transaction once the system has changed to XAPIC mode.

5.1.6 Buffy ASIC

Each CPU enclosure communicates with the Core I/O enclosures. This is achieved by a Buffy ASIC that resides on each of the CIOB PCI busses. Each Buffy accepts transactions destined for the IO enclosures on its PCI bus and encodes that data for transmission across the CPU-to-I/O bus. LVDS serializers and de-serializers on each of the CPU and I/O enclosures are used to

encode and decode data being transmitted across the bus. By using LVDS encoding, the number of pins required to interface the CPU enclosures to the I/O enclosures is greatly reduced.

The Buffy ASIC also receives data from the CPU-to-I/O bus sent by the Xena ASICs that reside on the I/O boards and decodes the northbound transactions before initiating a PCI transaction to the CIOB.

5.2 I/O Enclosure

The core I/O board provides the legacy I/O (keyboard, mouse, serial ports and IDE) for the ftServer T30 system. In addition to providing legacy support, it also provide the following features:

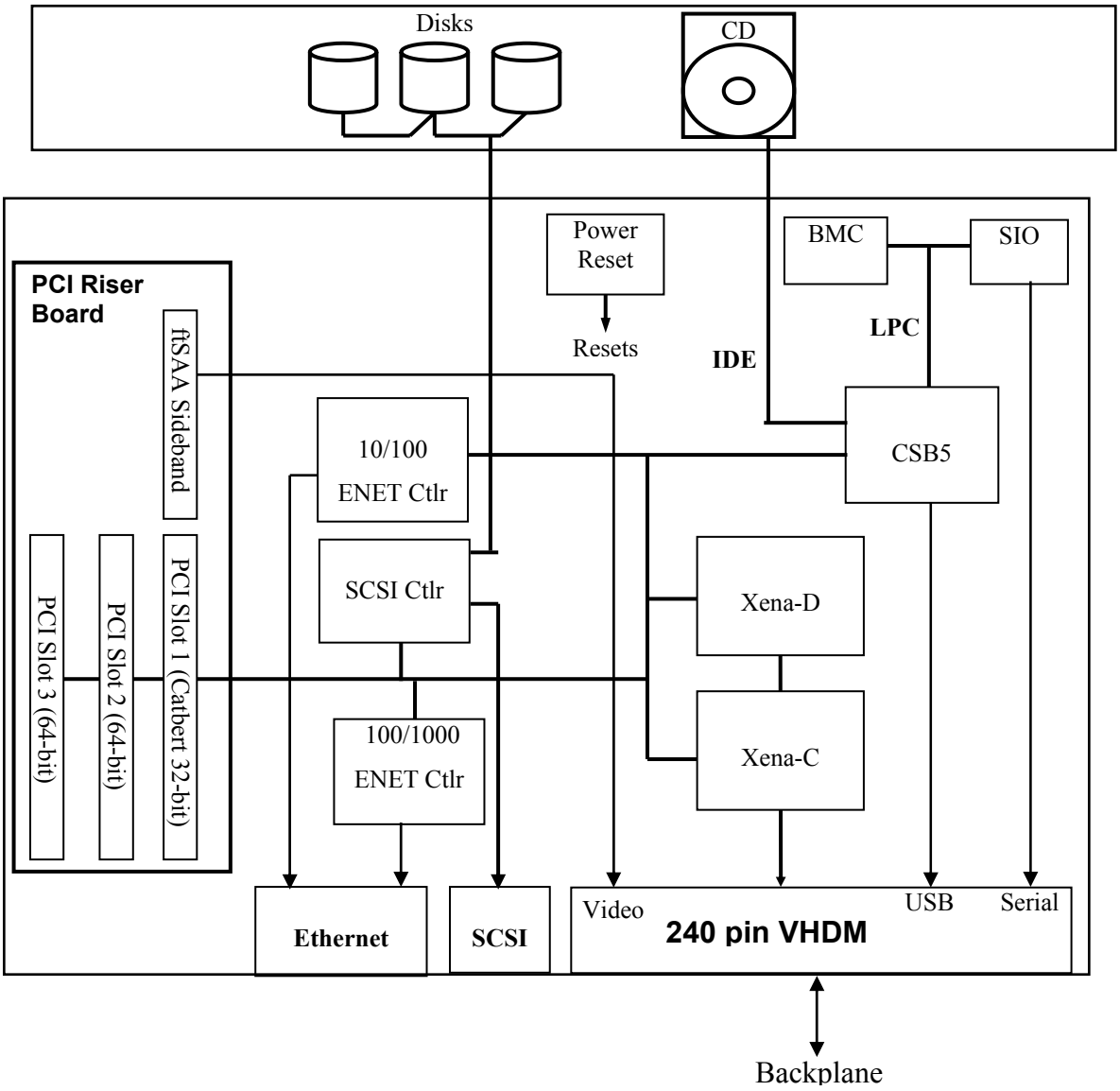
- Embedded SCSI controller
- SCSI backplane with 3 Ultra-3 SCSI slots
- 10/100 Ethernet controller
- 10/100/1000 Ethernet controller
- 2x64bit 33-MHz PCI slots
- 1x32bit 33-MHz PCI slot
- Video, through sideband connector for fault tolerant video
- External SCSI port

The heart of the core I/O board is the PCI bus provided by the Xena ASIC pair. This bus is a 64-bit bus operating at a frequency of 33 MHz. To increase performance, all of the PCI devices and PCI slots are connected directly to the primary PCI bus.

The heart of the board is the PCI bus provided by the Xena ASIC pair. This bus is a 64bit bus operating at a frequency of 33MHz. To increase performance all of the PCI devices and PCI slots are connected directly to the primary PCI bus.

The figure on the following page is a block diagram of the core I/O enclosure.

Figure 5-3. I/O Enclosure Block Diagram



5.2.1. User-Defined PCI Slots

The core I/O enclosure can accept up to three user-installed PCI cards. Two of the PCI slots are 64-bit 33-Mhz PCI slots, and the third is a 32-bit 33-Mhz slot. The PCI cards are inserted into the PCI riser card that is attached in a horizontal position to the core I/O board. PCI slot 1 (32-bit slot) can accept a video adapter. A sideband connector is provided to accommodate video, power and communication signals. To insert or remove a PCI card the whole core I/O enclosure must be removed.

For PCI card and embedded PCI controller configuration, the IDSEL lines of the devices/slots are connected as described in the following table,

Xena Primary Address Bit	Device Number	PCI device
16	0	PCI Slot 1
17	1	PCI Slot 2
18	2	PCI Slot 3
19	3	100/1000 Ethernet
21	5	12160 SCSI ctrlr
22	6	10/100 Ethernet
31	15	CSB5

5.2.2 SCSI Controler

The core I/O enclosure contains an embedded 12160 PCI-to-SCSI bridge from Qlogic. This controller contains two SCSI busses: one is connected to an Ultra-3 SCSI backplane contained within the core I/O enclosure, and the second goes to a 68-pin high density external connector located to the rear of the core I/O enclosure. The SCSI bus is connected to the internal SCSI backplane and the other is connected to the external connector.

The external port of the SCSI controller on the core I/O board supports both single-ended (SE) and Low Voltage Differential (LVD) SCSI. The SCSI mode is selected by the device plugged into the external port. The external SCSI port is used to control a SCSI tape drive

The internal backplane supports LVD disks. The disks installed in the core I/O enclosure are single initiated; therefore a failure of a core I/O board removes all of the disks in that core I/O enclosure from service. The disks in the partner core I/O board run in simplex mode until the faulty core I/O board has been replaced and the disks re-mirrored.

5.2.3 Ethernet Controllers

The T30 system Core I/O board has two embedded Ethernet controllers; the first is an Intel 82554 10/100/1000 Mbits/sec controller, and the second is an Intel 82559/82550 10/100 Mbits/sec controller.

The two Ethernet controllers share the following features:

- Full auto-negotiation for connection speed and half/full duplex

- Integrated MAC and Physical layer functions
- Serial PROM for device configuration
- Copper RJ45 network interface
- Bus mastering PCI controller
- Reside on Core I/O primary PCI bus.
- LEDs to indicate connection status/speed.

5.2.3.1 10/100-Mbit 82559/82550 Ethernet Controller

The ftServer T30system uses the 82559 or the 82550 Ethernet controller. The 82559/82550 Ethernet controllers are 32-bit PCI devices They are supplied in a 196BGA package device and reside on the lower 32-bits of the core I/O PCI bus. The device requires only a small number of external components to implement a complete fast Ethernet interface. Physical connection to this controller is through an RJ45 connector that contains integrated magnetic components to provide electrical isolation and LEDs to show connection status and connection speed. When the system is in a standby state, the 10/100-Mbit port is still powered and can communicate with the BMC through the interface. Through this interface the BMC can remotely power on and boot a system.

5.2.3.2 10/100/1000-Mbit 82544 Ethernet Controller

The 10/100/1000-Mbit/sec connection to the core I/O enclosure is provided by the 82544 Ethernet controller. This device supports full auto-negotiation to a 10/100/1000-Mbit Ethernet network. A pulse transformer located on the motherboard between the 82544 and the RJ45 connector is used to isolate the onboard receive and transmit lines from the external interface. The RJ45 connector used for the 10/100/100-Mbit Ethernet port also contains integrated LEDs for connection status and connection speed indication.

5.2.4 VHDM interface

The core I/O enclosure mates with the ftServer T30chassis backplane through a 240-pin VHDM connector. This connector contains a path for the following signals:

- Crossbow bus
- System management
- Video
- Serial
- USB
- Clock
- Board present
- Gsync bus
- Power to backplane

As with the CPU enclosure, the crossbow bus uses LVDS serializers and de-serializers to reduce connector pin count.

In order to prevent corruptIon of the crossbow bus when enclosures are inserted certain signals on the VHDM connector have shorter pins, these recessed pins are used to ensure the bus pins are securely mated before power is applied to the board.

5.2.5 Legacy I/O

The ftServer T30uses the CSB5 and a National Semiconductor PC87417 Server I/O controller to provide Legacy I/O support. The CSB5 resides on the primary Xena bus providing two USB ports and an IDE interface to the CD-ROM. The Server I/O device provides a Real Time Clock (RTC) along with interfaces to the two serial ports and the SMBus interface. The Server I/O communicates to the PCI interface through a PCI-LPC bridge contained within the CSB5. The CSB5 also contains an ACPI controller through which ACPI functionality is supported. The Core I/O in the ftServer T30system does not contain an internal floppy disk drive; instead the system supports an externally attached USB floppy drive.

Keyboard and mouse connection to the system is via the USB interface. The RTC and SMBus interfaces are powered from the standby power supplied by the PSU. This allows all system events to be time stamped, including events that occur when the system is powered off. Battery backup for the RTC and BIOS CMOS is provided to retain correct time when a system has been removed from its AC source. A backup battery is located on each of the Core I/O enclosures. There is no parallel port support on the ftServer T30system.

5.2.6 System Management

System management for the ftServer T30is designed to incorporate a server management module (SMM) that resides on each core I/O enclosure. The function of the SMM or Baseboard Management Controller (BMC) is to provide Intelligent Platform Management Interface (IPMI) functions, fault tolerant maintenance and diagnostics functions, and system control. The ftServer T30has been designed to support both distributed and centralized server management control.

The distributed server management strategy incorporates distributed intelligent management controllers on each I/O enclosure and CPU enclosure. Each core I/O enclosure incorporates a QLogic Zircon BMC intelligent controller that provides an IPMI Keyboard Controller Style (KCS) interface to the HOST over the low pin count (LPC) bus to the Serverworks CSB5 south bridge. Each CPU board uses a QLogic Zircon PM, implemented as a satellite management controller (SMC), reporting sensor events to the BMC and providing a bridge from the BMC to I^2C devices residing on the CPU's or ExpansIon I/O's local I^2C bus/SMBus.

Each of the BMC and SMC controllers contain an interface to I2C. The I2C port from the controllers are connected to I/O expanders and I2C compatible devices to provide access to system data including, fan rotation speed, temperature, voltage levels on the various enclosures and system ID. The I2C busses are also used to control system functions such as LEDs and component power control.

The secondary BMC controller monitors the health of the primary controller using a heartbeat protocol. If it does not receive heartbeats from the primary BMC for a specified period of time it assumes the primary controller has failed and will attempt to become the primary SMM. The BMC controller also monitors the state of the system OS when the system is booted. It uses a watchdog timer to determine if the OS has crashed or halted. In the event of a hung system, the SMM takes appropriate action to re-start the system.

5.3 4U Backplane

The ftServer T30 system contains a 4U backplane through which the CPU and I/O enclosures interconnect. Data is transferred between the CPU and I/O enclosures using the Stratus proprietary Crossbow Bus protocol.

The Backplane contains 180-pin VHDM male connectors to mate with the CPU enclosure. 240-pin VHDM male connectors mate with the core I/O enclosures. AC power is provided to each enclosure slot through an IEC power connector.

The backplane contains the system clock card, two IDPROMs, and the connector I/O card.

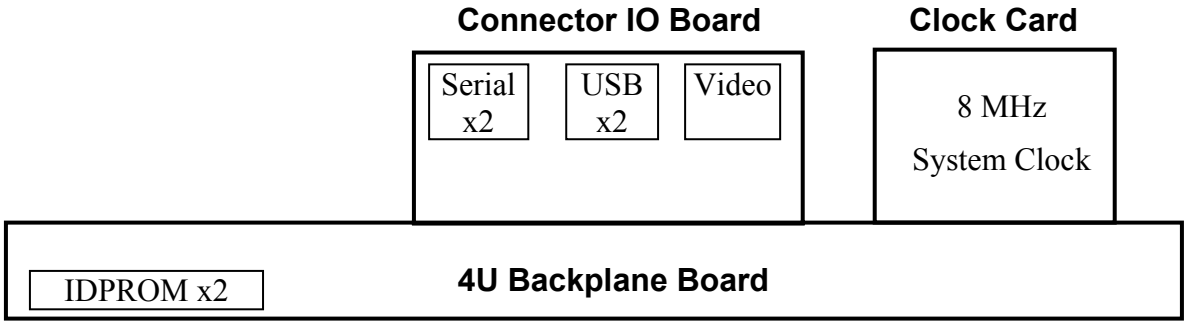
5.3.1 System Clock Card

The ftServer T30system contains only one clock card. This card supplies a copy of the 8 Mhz PECL clock to each of the slots in the chassis. The board contains the minimum number of parts required to generate the clocks to maximize the MTBF. A crystal oscillator is used to generate the 8.3333 Mhz with buffers to supply the required number of copies of the clock required by the system. To reduce system repair time, a spare clock card can be stored in a card holder on the backplane of each system shipped. This clock card is not powered and does not provide a fault tolerant clock. The system clock card is not hot pluggable and therefore the system must be powered off before the clock card is removed. The clock card is inserted into connector J5 on the SCSI backplane.

To reduce the risk of a system outage, the clocks are distributed using a pair of MC100LEVL14 clock buffers. Each buffer supplies clocks to specific slots, such that, in the event of a failure of one of the buffers, the alternate buffer will still supply clocks to one of the CPU and core I/O enclosures.

The following is a diagram of the backplane.

Figure 5-4. Backplane Diagram



5.3.2 Connector I/O board

The connector I/O board provides the following outputs to the user:

- Video X 1
- Serial ports X 2
- USB ports X 2

Only one of the core I/O enclosures can drive the video, serial, and USB ports at any one time. To achieve this, these signals from both core I/O boards are FET isolated and then wire ORed on the connector I/O board. The connector I/O board plugs into an 80 pin SCA-2 connector (J6) on the backplane.

The active compatibility core I/O enclosure drives the system I/O. In the event of a failure of the active compatibility core I/O the system, I/O transfers to the other core I/O enclosure after it has become the active compatibility core I/O.

Serial port two of the ftServer T30system can be used through a modem as a system management interface. This serial port is connected to the BMC controller on the core I/O board, Through this interface system events can be monitored and system power on/off can be controlled.

5.3 DC/AC Inverter

The DC/AC inverter converts standard –48 V battery power to constant AC power. The inverter consists of a 1 U (1.7 in, 73 mm) thin, true sinewave 2000 VA/1500 W inverter module rated for continuous duty, and a compatible backplane that contains DC input and AC output connectors.

The DC/AC inverter has the following features:

- High efficiency and reliability
- 3 kW, 4 kVA (5 s) surge capability
- Short circuit proof
- High performance noise filters on both input and output
- cCSAus, CE, NEBS LEVEL 3, FCC Class B approvals
- Input under/over voltage protection
- Output under/over voltage protection
- Incorrect connection protection
- Temperature limit shutdown
- Output overload protection

A proactive emailing system uses SMTP to inform the user that the unit has turned on or a fault condition has occurred.

5.4 Tape Subsystem

ftServer T30 systems support DDS-4 tabletop tape drives. No tape drives are mounted in the storage enclosure. They are all external to the cabinet.

The DDS-4 tape drive is the 4th generation of DDS products. DDS-4 has all of the benefits of previous DDS products with faster transfer speeds (3-6 MB/sec sustained), higher capacity and increased reliability. To achieve the speed and capacity benefits, DDS-4 150M media must be used. Cartridge capacity is 20 MB per cartridge native (40 MB per cartridge assuming 2:1 data compression). Previously archived data is easily accessible with read/write backward

compatibility. The drives implement the LVD interface. DDS-4 drives are available on ftServer 5240/6500 systems in both a single-cartridge mechanism and a 6 to 8-cartridge magazine autoloader configuration.

5.4.1 Tape Drive Configuration

Each core I/O enclosure can support up to two daisy-chained tape drives or a single non-daisy-chained tape drive. The first tape drive in a daisy chain connects to the external SCSI port on the core I/O enclosure.

The tape drive enclosure has two 68-pin Wide SCSI .050 series socket connectors that support a cable-in, cable-out daisy-chaining configuration or a cable-in and terminate configuration. There is a switch on the back of the enclosure that allows the selection of the device's SCSI ID.

The tape drive power supply is auto ranging to support 110-240 VAC and 47-63 Hz. A power switch is located on the back of the tape drive.

5.4.2 Tape Drive Termination

A tape drive is terminated externally if the drive is the last device on the SCSI bus. The terminator is a 68-pin SCSI-3, single-ended, low voltage differential, auto-switching multi-mode terminator.

5.4.3 Tape Drive Cabling

The maximum cable length for an LVD SCSI bus is 12 meters (approx. 39 ft.). The SCSI bus cable for the tape drives is available in three lengths: 12 ft., 20 ft., and 36 ft.

Each core I/O enclosure can support up to two daisy-chained tape drives or a single non-daisy-chained tape drive. The first tape drive in a daisy chain connects to the external SCSI port on the core I/O enclosure. If this is the only tape drive on the bus, it must be terminated by an external terminator. If a second tape drive is daisy chained to the first, it must be terminated since it is the last drive on the SCSI bus.

5.5 Power Subsystem

5.5.1 DC/AC Inverters

The ftServer T30 system contains two DC/AC inverters. Each inverter supplies power from a NEBS -48 VDC power plant to half of the ftServer T30 system.

Each DC/AC inverter connects to a separate backplane containing DC input and AC output connectors.

The DC/AC inverter is a digitally controlled power converter. It provides galvanic isolation from the DC input to the AC output. The isolation stage is a resonant full-bridge converter and the inversion stage is a highly efficient amplifier.

All user lines as well as communication lines between the units (CANbus and synchro lines are isolated from the input DC and output AC power potential.

The Digital Signal Processor (DSP) in the inverter continuously monitors a number of parameters for purposes of protecting the power source, load, inverter and user from hazardous conditions. Fuses on the DC input and AC output provide additional hardware fault protection. An alarm is triggered whenever a fault is detected. The protective action in the case of a fault is

to turn the inverter off. The inverter then enters a self-diagnosis loop until the fault causing the alarm clears.

5.5.2 AC Power

The system chassis contains a power block assembly with two AC line inputs and an individual output for each of the enclosures. In DC systems, the AC line inputs receive power from the DC/AC inverters. The following table shows which enclosures are powered from each of the AC inputs.

AC power block in 1 (Top)	**Core IO 0** **CPU 0**
AC power block in 2 (Bottom)	**Core IO 1** **CPU 1**

A failure of one of the AC sources does not result in a system outage, provided the system is running in DMR. Each of the I/O enclosures contains a switched mode power supply that provides power to that enclosure. Each of the CPU enclosures contain an individual power supply to power that enclosure.

House-keeping power required by the standby logic is available whenever the system is plugged in and AC is available. The standby power for each CPU and IO enclosure is supplied by the power supply within that enclosure. Power to the backplane, clock card and IO connector card is supplied from the core I/O enclosures through the VHDM connector.

The core IO motherboard provides power to components external to the core IO enclosure via analogue switches. The analogue switch contains current limiting circuitry and diode ORing to protect the motherboard from a short circuit. The following table shows which external components are powered by the core IO enclosure and the supply required.

Component	Supply
ID Prom	**VCC5_SBY**
USB power	**VCC5**
Clock board	**VCC3_3**
Gsync bus termination	**VCC5**

5.6 Cooling Subsystem

Airflow for system cooling is through the cabinet from front to back. Air does not re-circulate within the cabinet.

The CPU and IO enclosures are cooled with forced air-cooling provided by fans located within each enclosure. Each CPU enclosure contains three fan blowers and each Core IO enclosures has five cooling fans. Each of the fans in the system is monitored to ensure the fan is providing sufficient air flow. This is monitored using the tacho outputs from each of the fans. If any of the fans fall below specification,an alarm will be generated. A fan failure in any of the enclosures in the system is highlighted by the BMC status LEDs on the primary core IO enclosure. The fan failure, along with any other system error conditions, is highlighted by a flashing amber LED.

Temperature sensors are provided on each of the enclosure motherboards to provide temperature information to the BMC firmware and OS.

There is no forced-air cooling provided for the backplane or its components.

Each of the power supplies used in the system contains two internal fans to provide sufficient cooling for that power supply.

6. Upgrades

Currently there are no upgrades for the ftServer T30 system.

7. Part Numbers

The following table lists the part numbers for the Customer Replaceable Units (CRUs), Field Replaceable Units (FRUs), and Distributor Replaceable Units (DRUs) in ftServer T30 systems.

Description	CRU/FRU/DRU	Part Number
CPU Enclosure	**CRU**	**AA-G93300**
256-MB DDR DIMM	**CRU**	**AA-M22708**
512-MB DDR DIMM	**CRU**	**AA-M22800**
CPU LED Board Assembly	**CRU**	**AA-E70700**
CPU Enclosure Power Connector Board	**DRU**	**AA-E72100**
CPU Enclosure Motherboard	**DRU**	**AA-G93130**
CPU Enclosure Power Supply (350-Watt)	**CRU**	**AA-P70310**
CPU, 2.4-GHZ processor, and Heatsink Kit	**DRU**	**AK-000514**
CPU Enclosure Power Cable	**CRU**	**AW-020088**
CPU Enclosure Fan Assembly	**FRU**	**MF-000045**
CPU Enclosure LED Cable	**DRU**	**AW-001102**
CPU Enclosure Power Jumper	**FRU**	**AW-001106**
Core I/O Enclosure	**CRU**	**AA-E90500**
Core I/O Board	**DRU**	**AA-E70000**
Core I/O PCI Riser Board	**DRU**	**AA-E70400**
SCSI Backplane Assembly	**DRU**	**AA-E70500**
Core I/O LED Board Assembly	**CRU**	**AA-E70600**
Core I/O Enclosure Fan Assembly	**CRU**	**MA-000665**
CD-ROM Interface Board	**DRU**	**AA-E71500**
I/O Enclosure Power Supply (250-Watt)	**CRU**	**AA-P70100**
Core I/O Enclosure Power Switch Assembly	**DRU**	**AS-000389**
Core I/O Enclosure Ground Cable (14 AWG)	**DRU**	**AW-001117**
Core I/O Enclosure Internal Power Jumper Cable	**DRU**	**AW-001107**
Core I/O Enclosure IDE Cable	**DRU**	**AW-001124**
Core I/O Enclosure Power Switch with LED and Guard	**DRU**	**AW-001123**
Core I/O Enclosure LED Cable	**DRU**	**AW-001102**

CD ROM Drive	**CRU**	**AA-D55100**
U574 Dual-Port Fiber Gigabit Ethernet Adapter	**CRU**	**AA-U57400**
U574 Dual-Port Fiber Gigabit Ethernet Adapter & LC To SC Fibre Optic Upgrade Kit	**CRU**	**AA-U57400 & AK-000528**
U575 Dual-Port Copper Gigabit Ethernet Adapter	**CRU**	**AA-U57500**
U917 VGA Adapter	**CRU**	**AA-U91700**
U918 4- Port E1/T1 PCI Adapter	**CRU**	**AA-U91800**
Backplane Assembly	**CRU**	**AA-E72500**
Connector I/O Board	**CRU**	**AA-E70100**
4U Backplane Board	**CRU**	**AA-E70200**
System Clock	**CRU**	**AA-E70300**
Front Bezel	**CRU**	**AK-000511**
Air Filter	**CRU**	**MP-000928**
56K External Modem	**CRU**	**AA-C71900**
DC/AC Inverter, 120V	**CRU**	**AA-P70900**
Unit Inverter, 120V DC/AC	**CRU**	**AA-P86100**
Frame, Inverter, 120V DC/AC (includes cables)	**FRU**	**AA-P86200**
DC/AC Inverter 230V	**CRU**	**AA-P71100**
Unit Inverter, 230V DC/AC	**CRU**	**AA-P86400**
Frame, Inverter, 230V DC/AC (includes cables)	**FRU**	**AA-P86700**
UL/CSA Inverter DC ExtensionCable (Black/6AWG/20")	**CRU**	**AW-B52320**
UL/CAS Inverter AC Extension Cable (/6AWG/29")	**CRU**	**AW-001157**
AC Distribution Assembly	**FRU**	**AS-E63010**

8. Related Documentation

The following Stratus customer documents contain related information pertaining to ftServer T30 systems.

Part No.	Title
R001L	Stratus ftServer T30: Site Planning Guide
R002L	Stratus ftServer T30: Installation Guide
R003L	Stratus ftLinux System Administrator's Guide
R004L	Stratus ftServer T30: Operation and Maintenance Guide
R005L	Release Notes: Stratus ftLinux Release 2.1
R006L	Read Me First: Unpacking an ftServer T30 System
R013W	Stratus ftServer: ActiveService Network Configuration Guide
R1000LCD	Stratus ftServer T30 with ftLinux Release 2.1: Stratus ftLinux Migration White Paper Stratus ftServer T30 Configuration Specification